8	ENCY	E04496	180104	7591	845504	1653248
8	ENCY	E04497	166106	8869	2069696	2880704
8	ENCY	E04498	181004	8165	1653312	367232
8	ENCY	E04499	181104	8165	1653312	367232
8	ENCY	E04604	185004	8112	2800576	3611648
8	ENCY	E04605	185104	8112	2800576	3611648
8	ENCY	E04607	193104	9144	1967936	2778944
8	ENCY	E04608	195004	8524	3590144	197184
8	ENCY	E04611	188004	8173	1068992	1850624
8	ENCY	E04612	186004	8673	3611712	227648
8	ENCY	E04613	187004	8198	228928	1031808
8	ENCY	E04614	187104	8198	228928	1031808
8	ENCY	E04616	219104	9016	2085120	2896192
8	ENCY	E04620	189004	9425	1850688	2661760
8	ENCY	E04621	189104	9425	1850688	2661760
8	ENCY	E04622	190004	7825	2661824	344064
8	ENCY	E04623	190104	7825	2661824	344064
8	ENCY	E04624	192004	9876	1159424	1967872
8	ENCY	E04625	186104	8673	3611712	227648
8	ENCY	E04632	248104	7163	441344	1252416
8	ENCY	E04633	165004	9103	1258560	2069632
8	ENCY	E04634	165104	9103	1258560	2069632
8	ENCY	E04635	242104	9363	3963328	579968
8	ENCY	E04636	243104	8124	580224	1388992
8	ENCY	E04637	219004	9016	2085120	2896192
8	ENCY	E04638	193004	9144	1967936	2778944
8	ENCY	E04640	215004	8512	3037504	3846016
8	ENCY	E04641	194004	8905	2779008	3590080
8	ENCY	E04642	194104	8905	2779008	3590080
8	ENCY	E04645	200004	9480	3451392	68096
8	ENCY	E04646	202104	8495	883008	1690304
8	ENCY	E04647	201004	9373	68160	878016
8	ENCY	E04648	203104	9284	1690368	2501440
8	ENCY	E04649	242004	9363	3963328	579968
8	ENCY	E04650	297104	7085	2436800	3247168
8	ENCY	E04651	207105	8862	740480	1551488
8	ENCY	E04654	244004	7511	1393664	2200512
8	ENCY	E04656	202004	8495	883008	1690304
8	ENCY	E04658	204104	8999	2501504	3312512
8	ENCY	E04662	215104	8512	3037504	3846016
8	ENCY	E04663	203004	9284	1690368	2501440
8	ENCY	E04665	204004	8999	2501504	3312512
8	ENCY	E04667	206004	8496	4123712	740416
8	ENCY	E04668	207005	8862	740480	1551488
8	ENCY	E04669	205004	8498	3312576	4123648
8	ENCY	E04670	205104	8498	3312576	4123648
8	ENCY	E04673	206004	8496	4123712	740416
8	ENCY	E04674	209005	9232	2362688	3173696
8	ENCY	E04677	208009	10066	1551552	2362624
8	ENCY	E04678	208109	10066	1551552	2362624
8	ENCY	E04680	240104	10008	2341120	3152128
8	ENCY	E04681	298104	5367	3248064	4057216
8	ENCY	E04687	209105	9232	2362688	3173696
8	ENCY	E04688	210104	9141	3176448	3984832
8	ENCY	E04689	241004	9332	3152192	3963264
8	ENCY	E04690	210004	9141	3176448	3984832
8	ENCY	E04692	220104	8679	2896256	3703232
8	ENCY	E04693	241104	9332	3152192	3963264
8	ENCY	E05003	220004	8679	2896256	3703232
8	ENCY	E05006	225104	6304	2757440	3568512
8	ENCY	E05007	222005	8589	327104	1135168
8	ENCY	E05010	222105	8589	327104	1135168
8	ENCY	E05011	224104	7846	1946368	2757376
8	ENCY	E05013	224004	7846	1946368	2757376
8	ENCY	E05015	284003	3329	303104	1048896
8	ENCY	E05016	246104	7583	3013440	3824512

8	ENCY	E05019	223004	8194	1135232	1946304
8	ENCY	E05020	226104	6974	3568576	176832
8	ENCY	E05022	223104	8194	1135232	1946304
8	ENCY	E05023	247104	7697	3824576	441280
8	ENCY	E05024	221004	7618	3707520	307328
8	ENCY	E05025	221104	7618	3707520	307328
8	ENCY	E05026	227105	7755	185536	996416
8	ENCY	E05027	226004	6974	3568576	176832
8	ENCY	E05028	228005	8629	996480	1807488
8	ENCY	E05029	228105	8629	996480	1807488
8	ENCY	E05030	229104	8503	1807552	2618624
8	ENCY	E05031	227005	7755	185536	996416
8	ENCY	E05032	230104	8816	2618688	3429696
8	ENCY	E05033	229004	8503	1807552	2618624
8	ENCY	E05034	231104	9092	3429760	46528
8	ENCY	E05035	230004	8816	2618688	3429696
8	ENCY	E05037	296004	8585	1625664	2436736
8	ENCY	E05042	296104	8585	1625664	2436736
8	ENCY	E05046	231004	9092	3429760	46528
8	ENCY	E05050	239004	8881	1529984	2341056
8	ENCY	E05051	309005	4770	3780544	396672
8	ENCY	E05057	234003	8082	1668800	2478016
8	ENCY	E05058	234103	8082	1668800	2478016
8	ENCY	E05059	235006	9314	2479872	3290944
8	ENCY	E05060	235106	9314	2479872	3290944
8	ENCY	E05061	236108	10615	3291008	4102016
8	ENCY	E05065	237106	9570	4102080	718848
8	ENCY	E05067	238104	9858	718912	1529920
8	ENCY	E05069	237006	9570	4102080	718848
8	ENCY	E05070	239104	8881	1529984	2341056
8	ENCY	E05071	297004	7085	2436800	3247168
8	ENCY	E05077	238004	9858	718912	1529920
8	ENCY	E05081	246004	7583	3013440	3824512
8	ENCY	E05086	249104	7874	1252480	2063488
8	ENCY	E05087	247004	7697	3824576	441280
8	ENCY	E05088	250104	8594	2063552	2874432
8	ENCY	E05093	243004	8124	580224	1388992
8	ENCY	E05094	244104	7511	1393664	2200512
8	ENCY	E05095	249004	7874	1252480	2063488
8	ENCY	E05096	251104	8732	2875456	3685696
8	ENCY	E05097	250004	8594	2063552	2874432
8	ENCY	E05098	252104	8231	3685760	302272
8	ENCY	E05099	251004	8732	2875456	3685696
8	ENCY	E05100	253104	7576	303232	1113600
8	ENCY	E05101	252004	8231	3685760	302272
8	ENCY	E05102	254004	8563	1113664	1924736
8	ENCY	E05103	299104	6150	4059712	675712
8	ENCY	E05113	270004	7370	1508480	2319488
8	ENCY	E05115	255004	8008	1924800	2735808
8	ENCY	E05116	255104	8008	1924800	2735808
8	ENCY	E05117	256004	6137	2737408	3546944
8	ENCY	E05118	256104	6137	2737408	3546944
8	ENCY	E05119	257104	4478	3547008	163712
8	ENCY	E05120	267105	8404	3269440	4074112
8	ENCY	E05121	253004	7576	303232	1113600
8	ENCY	E05122	254104	8563	1113664	1924736
8	ENCY	E05123	257004	4478	3547008	163712
8	ENCY	E05124	267005	8404	3269440	4074112
8	ENCY	E05128	280004	3406	1230912	2041920
8	ENCY	E05132	298004	5367	3248064	4057216
8	ENCY	E05134	280104	3406	1230912	2041920
8	ENCY	E05136	259104	5908	976064	1779712
8	ENCY	E05137	260003	4963	1794752	2591296
8	ENCY	E05138	259004	5908	976064	1779712
8	ENCY	E05139	260103	4963	1794752	2591296
8	ENCY	E05140	261003	5186	2601536	3397760

8	ENCY	E05141	261103	5186	2601536	3397760
8	ENCY	E05142	262104	6553	3412160	22272
8	ENCY	E05143	263104	7719	26240	832704
8	ENCY	E05144	262004	6553	3412160	22272
8	ENCY	E05145	264104	7830	837760	1646912
8	ENCY	E05146	263004	7719	26240	832704
8	ENCY	E05147	265104	7788	1648896	2458304
8	ENCY	E05148	264004	7830	837760	1646912
8	ENCY	E05149	266104	7779	2458368	3269376
8	ENCY	E05150	265004	7788	1648896	2458304
8	ENCY	E05151	268104	8181	4085312	697280
8	ENCY	E05152	266004	7779	2458368	3269376
8	ENCY	E05160	258004	4670	163776	974208
8	ENCY	E05161	258104	4670	163776	974208
8	ENCY	E05162	300104	7486	675776	1484672
8	ENCY	E05172	268004	8181	4085312	697280
8	ENCY	E05173	270104	7370	1508480	2319488
8	ENCY	E05175	271104	6850	2319552	3130624
8	ENCY	E05180	281104	4126	2041984	2853056
8	ENCY	E05181	282104	3877	2853120	3664128
8	ENCY	E05182	281004	4126	2041984	2853056
8	ENCY	E05184	272104	7076	3130688	3941696
8	ENCY	E05185	271004	6850	2319552	3130624
8	ENCY	E05186	273104	6129	3941760	558528
8	ENCY	E05187	272004	7076	3130688	3941696
8	ENCY	E05188	274104	6659	558592	1368960
8	ENCY	E05189	273004	6129	3941760	558528
8	ENCY	E05190	275104	6908	1370496	2180736
8	ENCY	E05191	274004	6659	558592	1368960
8	ENCY	E05192	276104	5841	2192640	2991808
8	ENCY	E05193	275004	6908	1370496	2180736
8	ENCY	E05194	277104	5142	2991872	3802944
8	ENCY	E05210	276004	5841	2192640	2991808
8	ENCY	E05211	278104	4438	3803008	406272
8	ENCY	E05212	283003	3835	3664192	261952
8	ENCY	E05218	277004	5142	2991872	3802944
8	ENCY	E05219	279104	4147	428864	1230848
8	ENCY	E05221	323108	6277	2556992	3363584
8	ENCY	E05222	278004	4438	3803008	406272
8	ENCY	E05223	617010	6259	1008192	1698880
8	ENCY	E05224	279004	4147	428864	1230848
8	ENCY	E05225	282004	3877	2853120	3664128
8	ENCY	E05230	283103	3835	3664192	261952
8	ENCY	E05234	284103	3329	303104	1048896
8	ENCY	E05236	286003	4694	1914880	2714304
8	ENCY	E05238	286103	4694	1914880	2714304
8	ENCY	E05241	287004	4637	2714368	3525376
8	ENCY	E05242	287104	4637	2714368	3525376
8	ENCY	E05246	309105	4770	3780544	396672
8	ENCY	E05247	310005	7495	396736	1207808
8	ENCY	E05248	288104	4402	3525440	142144
8	ENCY	E05249	289104	4147	147712	951744
8	ENCY	E05250	299004	6150	4059712	675712
8	ENCY	E05251	288004	4402	3525440	142144
8	ENCY	E05252	290104	3445	983872	1755776
8	ENCY	E05253	289004	4147	147712	951744
8	ENCY	E05254	291104	4330	1769792	2575488
8	ENCY	E05255	290004	3445	983872	1755776
8	ENCY	E05256	292104	4452	2575552	3386624
8	ENCY	E05257	291004	4330	1769792	2575488
8	ENCY	E05258	293104	5176	3386688	1600
8	ENCY	E05267	292004	4452	2575552	3386624
8	ENCY	E05268	285106	3729	1113664	1893568
8	ENCY	E05269	293004	5176	3386688	1600
8	ENCY	E05270	301104	6630	1501248	2288128
8	ENCY	E05275	300004	7486	675776	1484672

8	ENCY	E05277	301004	6630	1501248	2288128
8	ENCY	E05279	302004	6347	2299008	3107008
8	ENCY	E05280	302104	6347	2299008	3107008
8	ENCY	E05281	307004	5780	2178816	2965248
8	ENCY	E05286	303105	5810	3113600	3916224
8	ENCY	E05287	310105	7495	396736	1207808
8	ENCY	E05290	303005	5810	3113600	3916224
8	ENCY	E05291	304005	4847	3937664	520000
8	ENCY	E05292	304105	4847	3937664	520000
8	ENCY	E05293	305104	6656	536256	1341952
8	ENCY	E05296	306104	6050	1356672	2132736
8	ENCY	E05302	305004	6656	536256	1341952
8	ENCY	E05303	307104	5780	2178816	2965248
8	ENCY	E05304	306004	6050	1356672	2132736
8	ENCY	E05305	308104	6001	2969536	3779264
8	ENCY	E05310	308004	6001	2969536	3779264
8	ENCY	E05311	311004	6233	1207872	2018880
8	ENCY	E05314	315104	6328	257984	1065472
8	ENCY	E05316	311104	6233	1207872	2018880
8	ENCY	E05317	312104	6738	2018944	2830016
8	ENCY	E05319	312004	6738	2018944	2830016
8	ENCY	E05321	313004	6386	2830080	3641152
8	ENCY	E05322	313104	6386	2830080	3641152
8	ENCY	E05324	314104	6131	3641216	257920
8	ENCY	E05326	314004	6131	3641216	257920
8	ENCY	E05328	315004	6328	257984	1065472
8	ENCY	E05336	320104	4874	122496	930240
8	ENCY	E05338	317104	3752	1882240	2679296
8	ENCY	E05339	318104	3195	2695552	3501440
8	ENCY	E05340	317004	3752	1882240	2679296
8	ENCY	E05342	318004	3195	2695552	3501440
8	ENCY	E05349	316004	4046	1071552	1879616
8	ENCY	E05350	316104	4046	1071552	1879616
8	ENCY	E05351	320004	4874	122496	930240
8	ENCY	E05353	322104	5607	1741440	2518400
8	ENCY	E05354	340005	8715	3758400	375168
8	ENCY	E05358	328004	5510	2418304	3224064
8	ENCY	E05360	319004	5166	3503488	107904
8	ENCY	E05361	319104	5166	3503488	107904
8	ENCY	E05362	322004	5607	1741440	2518400
8	ENCY	E05363	340105	8715	3758400	375168
8	ENCY	E05366	324105	6532	3363648	4171392
8	ENCY	E05368	321004	4537	930304	1741376
8	ENCY	E05369	321104	4537	930304	1741376
8	ENCY	E05370	479005	7696	3622272	238848
8	ENCY	E05371	326104	6587	791552	1590400
8	ENCY	E05373	325005	7226	4176832	791488
8	ENCY	E05375	341005	6550	375232	1185792
8	ENCY	E05376	341105	6550	375232	1185792
8	ENCY	E05377	343005	8501	1997440	2802816
8	ENCY	E05378	342005	8136	1186304	1997376
8	ENCY	E05382	327007	4758	1605184	2407552
8	ENCY	E05385	326004	6587	791552	1590400
8	ENCY	E05386	327107	4758	1605184	2407552
8	ENCY	E05387	328104	5510	2418304	3224064
8	ENCY	E05388	329104	8040	3230400	4032640
8	ENCY	E05393	330104	7340	4038720	652672
8	ENCY	E05394	329004	8040	3230400	4032640
8	ENCY	E05395	331104	7210	652800	1460992
8	ENCY	E05396	330004	7340	4038720	652672
8	ENCY	E05397	332104	7714	1482240	2274944
8	ENCY	E05400	331004	7210	652800	1460992
8	ENCY	E05401	333104	6253	2275008	3086016
8	ENCY	E05405	331005	7210	652800	1460992
8	ENCY	E05406	332004	7714	1482240	2274944
8	ENCY	E05408	333004	6253	2275008	3086016

8	ENCY	E05410	334004	6132	3086080	3897088
8	ENCY	E05411	334104	6132	3086080	3897088
8	ENCY	E05412	335104	8643	3897216	513920
8	ENCY	E05413	336104	10071	513984	1325056
8	ENCY	E05419	335004	8643	3897216	513920
8	ENCY	E05420	337104	9599	1325120	2136128
8	ENCY	E05421	336004	10071	513984	1325056
8	ENCY	E05425	337004	9599	1325120	2136128
8	ENCY	E05427	338004	8672	2136192	2946624
8	ENCY	E05428	338104	8672	2136192	2946624
8	ENCY	E05429	339006	9542	2948032	3758336
8	ENCY	E05431	339106	9542	2948032	3758336
8	ENCY	E05434	342105	8136	1186304	1997376
8	ENCY	E05436	343105	8501	1997440	2802816
8	ENCY	E05437	344106	6282	2809984	3619584
8	ENCY	E05438	345005	7539	3619648	236416
8	ENCY	E05441	344006	6282	2809984	3619584
8	ENCY	E05442	345105	7539	3619648	236416
8	ENCY	E05449	347104	5144	1062720	1858624
8	ENCY	E05450	348106	6967	1858688	2669696
8	ENCY	E05451	347004	5144	1062720	1858624
8	ENCY	E05452	349108	6143	2669760	3463232
8	ENCY	E05453	346004	6368	236480	1013952
8	ENCY	E05454	346104	6368	236480	1013952
8	ENCY	E05455	348006	6967	1858688	2669696
8	ENCY	E05461	349008	6143	2669760	3463232
8	ENCY	E05463	350004	7048	3481088	96896
8	ENCY	E05464	350104	7048	3481088	96896
8	ENCY	E05465	351104	4199	99840	854912
8	ENCY	E05466	352104	497	922880	1719680
8	ENCY	E05467	351004	4199	99840	854912
8	ENCY	E05468	353104	1639	1720064	2454656
8	ENCY	E05471	357007	4230	770048	1577344
8	ENCY	E05473	352004	497	922880	1719680
8	ENCY	E05474	354104	4681	2604864	3334080
8	ENCY	E05475	353004	1639	1720064	2454656
8	ENCY	E05480	364006	3030	2253440	3058816
8	ENCY	E05482	354004	4681	2604864	3334080
8	ENCY	E05483	355007	4626	3347648	4153152
8	ENCY	E05485	355107	4626	3347648	4153152
8	ENCY	E05487	356104	3444	4153216	769984
8	ENCY	E05488	356004	3444	4153216	769984
8	ENCY	E05489	357107	4230	770048	1577344
8	ENCY	E05490	358106	5524	1601472	2392192
8	ENCY	E05495	359007	6791	2392256	3202944
8	ENCY	E05497	358006	5524	1601472	2392192
8	ENCY	E05499	359107	6791	2392256	3202944
8	ENCY	E05502	360104	6120	3203392	4003264
8	ENCY	E05503	361008	6537	4019776	631168
8	ENCY	E05504	360004	6120	3203392	4003264
8	ENCY	E05507	363105	5108	1457536	2251328
8	ENCY	E05511	379003	5536	1872896	2646784
8	ENCY	E05512	361108	6537	4019776	631168
8	ENCY	E05513	366004	4252	3875712	490496
8	ENCY	E05514	363005	5108	1457536	2251328
8	ENCY	E05515	366104	4252	3875712	490496
8	ENCY	E05516	362004	4971	631232	1436928
8	ENCY	E05517	362104	4971	631232	1436928
8	ENCY	E05524	367104	2941	530688	1297216
8	ENCY	E05525	368003	3349	1316160	2114624
8	ENCY	E05526	364106	3030	2253440	3058816
8	ENCY	E05527	365005	4719	3064640	3875520
8	ENCY	E05528	365105	4719	3064640	3875520
8	ENCY	E05529	367004	2941	530688	1297216
8	ENCY	E05530	368103	3349	1316160	2114624
8	ENCY	E05534	508004	8733	1547648	2358272

8	ENCY	E05537	383118	5799	893120	1669440
8	ENCY	E05539	369104	4120	2114688	2890624
8	ENCY	E05541	369004	4120	2114688	2890624
8	ENCY	E05543	370004	2240	2930880	3736832
8	ENCY	E05544	370104	2240	2930880	3736832
8	ENCY	E05550	372004	3525	353728	1164736
8	ENCY	E05551	372104	3525	353728	1164736
8	ENCY	E05552	513003	7076	1408448	2219456
8	ENCY	E05553	373104	3923	1164800	1922432
8	ENCY	E05554	374104	4396	1977344	2786944
8	ENCY	E05555	373004	3923	1164800	1922432
8	ENCY	E05556	375105	3830	2787008	3598080
8	ENCY	E05559	374004	4396	1977344	2786944
8	ENCY	E05560	384003	5213	1713792	2462912
8	ENCY	E05562	375005	3830	2787008	3598080
8	ENCY	E05567	376005	4542	3598144	214848
8	ENCY	E05568	376105	4542	3598144	214848
8	ENCY	E05573	378003	5477	1026048	1823040
8	ENCY	E05574	371004	2631	3736896	353600
8	ENCY	E05575	371104	2631	3736896	353600
8	ENCY	E05576	378103	5477	1026048	1823040
8	ENCY	E05577	379103	5536	1872896	2646784
8	ENCY	E05581	380003	5989	2703104	3453312
8	ENCY	E05582	380103	5989	2703104	3453312
8	ENCY	E05583	381003	7230	3474176	67136
8	ENCY	E05584	381103	7230	3474176	67136
8	ENCY	E05585	382003	5429	104384	875456
8	ENCY	E05586	382103	5429	104384	875456
8	ENCY	E05591	383018	5799	893120	1669440
8	ENCY	E05592	384103	5213	1713792	2462912
8	ENCY	E05595	447004	8287	2832640	3632512
8	ENCY	E05596	389104	7315	576576	1385472
8	ENCY	E05597	500104	8063	3446976	63680
8	ENCY	E05598	501104	8375	63744	874816
8	ENCY	E05600	390104	5783	1387776	2188352
8	ENCY	E05601	385004	8508	2512704	3320512
8	ENCY	E05602	387005	7001	4131712	3959680
8	ENCY	E05603	385104	8508	2512704	3320512
8	ENCY	E05604	389004	7315	576576	1385472
8	ENCY	E05605	391104	7338	2202688	3009792
8	ENCY	E05606	390004	5783	1387776	2188352
8	ENCY	E05608	391004	7338	2202688	3009792
8	ENCY	E05614	386004	4741	3320576	4131648
8	ENCY	E05616	393005	7162	3820992	437696
8	ENCY	E05623	492004	7676	1156160	1963456
8	ENCY	E05624	392004	8452	3009856	3820928
8	ENCY	E05625	394104	7964	437760	1248832
8	ENCY	E05626	478005	7747	2811136	3622208
8	ENCY	E05628	413005	7419	3265920	4076672
8	ENCY	E05629	394004	7964	437760	1248832
8	ENCY	E05630	395104	7012	1248896	2059904
8	ENCY	E05632	393105	7162	3820992	437696
8	ENCY	E05634	396105	6630	2059968	2869824
8	ENCY	E05635	395004	7012	1248896	2059904
8	ENCY	E05636	397005	6685	2910976	3682112
8	ENCY	E05642	397105	6685	2910976	3682112
8	ENCY	E05643	396005	6630	2059968	2869824
8	ENCY	E05645	399104	7339	299008	1110080
8	ENCY	E05647	400104	7532	1110144	1919936
8	ENCY	E05649	399004	7339	299008	1110080
8	ENCY	E05650	413105	7419	3265920	4076672
8	ENCY	E05651	401105	6076	1958400	2728000
8	ENCY	E05652	400004	7532	1110144	1919936
8	ENCY	E05653	499004	8930	2635840	3446912
8	ENCY	E05654	422103	7269	2177216	2988288
8	ENCY	E05656	475004	7453	377856	1188864

8	ENCY	E05658	475104	7453	377856	1188864
8	ENCY	E05659	392104	8452	3009856	3820928
8	ENCY	E05660	386104	4741	3320576	4131648
8	ENCY	E05661	402005	4815	2759488	3536960
8	ENCY	E05662	415006	7174	693824	1498944
8	ENCY	E05663	407106	6963	2603392	3370496
8	ENCY	E05664	404003	3538	182272	953216
8	ENCY	E05665	407006	6963	2603392	3370496
8	ENCY	E05666	404103	3538	182272	953216
8	ENCY	E05667	406104	6565	1807296	2563200
8	ENCY	E05669	412104	6958	2465536	3265856
8	ENCY	E05670	388004	6578	3961984	576512
8	ENCY	E05671	388104	6578	3961984	576512
8	ENCY	E05673	410105	4522	846336	1602432
8	ENCY	E05674	406004	6565	1807296	2563200
8	ENCY	E05677	408104	4065	3410304	4178816
8	ENCY	E05678	430004	7983	227776	1038784
8	ENCY	E05679	409005	4012	44032	793536
8	ENCY	E05680	411003	4882	1655104	2411072
8	ENCY	E05681	430104	7983	227776	1038784
8	ENCY	E05685	437104	7952	1711232	2522240
8	ENCY	E05686	415106	7174	693824	1498944
8	ENCY	E05694	414106	6954	4086720	693760
8	ENCY	E05695	412004	6958	2465536	3265856
8	ENCY	E05696	414006	6954	4086720	693760
8	ENCY	E05697	420106	7539	555008	1366080
8	ENCY	E05698	405004	7114	989632	1757376
8	ENCY	E05699	416105	7326	1553216	2315968
8	ENCY	E05708	421004	8265	1366144	2177152
8	ENCY	E05709	421004	8265	1366144	2177152
8	ENCY	E05711	499104	8930	2635840	3446912
8	ENCY	E05712	532004	9148	3780800	397568
8	ENCY	E05714	405104	7114	989632	1757376
8	ENCY	E05715	420006	7539	555008	1366080
8	ENCY	E05716	417104	8339	2316032	3115456
8	ENCY	E05717	416005	7326	1553216	2315968
8	ENCY	E05718	418104	7156	3133056	3938176
8	ENCY	E05719	417004	8339	2316032	3115456
8	ENCY	E05720	419004	7679	3938240	554944
8	ENCY	E05721	401005	6076	1958400	2728000
8	ENCY	E05722	402105	4815	2759488	3536960
8	ENCY	E05725	506104	8549	4119296	736064
8	ENCY	E05731	418004	7156	3133056	3938176
8	ENCY	E05732	419104	7679	3938240	554944
8	ENCY	E05733	508104	8733	1547648	2358272
8	ENCY	E05734	422003	7269	2177216	2988288
8	ENCY	E05737	438104	7489	2522304	3333376
8	ENCY	E05738	437004	7952	1711232	2522240
8	ENCY	E05739	439104	6988	3333440	4144448
8	ENCY	E05742	423004	8400	2988352	3789184
8	ENCY	E05743	423104	8400	2988352	3789184
8	ENCY	E05744	424005	7638	3819136	416192
8	ENCY	E05745	424105	7638	3819136	416192
8	ENCY	E05746	425104	7365	416256	1227328
8	ENCY	E05747	425004	7365	416256	1227328
8	ENCY	E05748	426104	7643	1227392	2018496
8	ENCY	E05749	427005	8418	2046336	2844352
8	ENCY	E05752	426004	7643	1227392	2018496
8	ENCY	E05753	427105	8418	2046336	2844352
8	ENCY	E05756	428104	9081	2855168	3635776
8	ENCY	E05757	429104	6972	3665920	227712
8	ENCY	E05758	438004	7489	2522304	3333376
8	ENCY	E05763	428004	9081	2855168	3635776
8	ENCY	E05765	429004	6972	3665920	227712
8	ENCY	E05767	447104	8287	2832640	3632512
8	ENCY	E05768	431005	8437	1038848	1849920

8	ENCY	E05769	440104	7586	4144512	761280
8	ENCY	E05771	431105	8437	1038848	1849920
8	ENCY	E05772	432104	6891	1849984	2623680
8	ENCY	E05773	433104	7419	2664832	3472128
8	ENCY	E05774	432004	6891	1849984	2623680
8	ENCY	E05775	434106	7255	3472192	87616
8	ENCY	E05776	433004	7419	2664832	3472128
8	ENCY	E05777	435105	6964	94272	900032
8	ENCY	E05778	435005	6964	94272	900032
8	ENCY	E05779	436104	8078	900096	1711168
8	ENCY	E05780	434006	7255	3472192	87616
8	ENCY	E05782	436004	8078	900096	1711168
8	ENCY	E05798	439004	6988	3333440	4144448
8	ENCY	E05799	441001	7624	761344	1572352
8	ENCY	E05800	445004	6364	1231680	2021504
8	ENCY	E05802	445104	6364	1231680	2021504
8	ENCY	E05803	451104	6557	1883776	2693824
8	ENCY	E05804	442004	7368	1572416	2383488
8	ENCY	E05805	442104	7368	1572416	2383488
8	ENCY	E05809	443005	7331	2383552	399296
8	ENCY	E05810	443105	7331	2383552	399296
8	ENCY	E05811	485004	7487	100288	480000
8	ENCY	E05813	444105	7855	399360	1196288
8	ENCY	E05816	444005	7855	399360	1196288
8	ENCY	E05817	446104	6568	2021568	2832576
8	ENCY	E05822	440004	7586	4144512	761280
8	ENCY	E05823	441101	7624	761344	1572352
8	ENCY	E05824	446004	6568	2021568	2832576
8	ENCY	E05830	408004	4065	3410304	4178816
8	ENCY	E05831	409105	4012	44032	793536
8	ENCY	E05834	450104	5702	1093120	1875072
8	ENCY	E05835	452104	8075	2693888	3504960
8	ENCY	E05838	450004	5702	1093120	1875072
8	ENCY	E05840	451004	6557	1883776	2693824
8	ENCY	E05841	453104	8665	3505024	121728
8	ENCY	E05842	449004	6423	260544	1068928
8	ENCY	E05843	449104	6423	260544	1068928
8	ENCY	E05844	452004	8075	2693888	3504960
8	ENCY	E05845	454104	8069	121792	893376
8	ENCY	E05848	498004	8271	1824768	2635776
8	ENCY	E05849	485104	7487	100288	480000
8	ENCY	E05851	455104	7777	952576	1743936
8	ENCY	E05854	454004	8069	121792	893376
8	ENCY	E05856	455004	7777	952576	1743936
8	ENCY	E05858	456004	6938	1744000	2555072
8	ENCY	E05859	456104	6938	1744000	2555072
8	ENCY	E05862	461004	8197	1605248	2411520
8	ENCY	E05863	457104	6461	2555136	3366144
8	ENCY	E05865	457004	6461	2555136	3366144
8	ENCY	E05866	459003	8389	4177344	793856
8	ENCY	E05872	459103	8389	4177344	793856
8	ENCY	E05873	464005	7631	4038528	655296
8	ENCY	E05874	464105	7631	4038528	655296
8	ENCY	E05876	461104	8197	1605248	2411520
8	ENCY	E05877	462104	8059	2417728	3227392
8	ENCY	E05878	463104	7789	3227456	4038464
8	ENCY	E05879	458004	7387	3366208	4177280
8	ENCY	E05880	458104	7387	3366208	4177280
8	ENCY	E05881	486104	8475	480064	1288064
8	ENCY	E05884	462004	8059	2417728	3227392
8	ENCY	E05887	463004	7789	3227456	4038464
8	ENCY	E05890	467104	8270	2277568	3088640
8	ENCY	E05891	460004	7667	794432	1605184
8	ENCY	E05892	460104	7667	794432	1605184
8	ENCY	E05893	465004	8388	655360	1461952
8	ENCY	E05894	465104	8388	655360	1461952

8	ENCY	E05898	468104	8182	3088704	3882048
8	ENCY	E05899	467004	8270	2277568	3088640
8	ENCY	E05900	469104	8382	3907712	511488
8	ENCY	E05901	532104	9148	3780800	397568
8	ENCY	E05902	487104	7011	1309632	2102208
8	ENCY	E05904	498104	8271	1824768	2635776
8	ENCY	E05907	468004	8182	3088704	3882048
8	ENCY	E05908	470104	8606	519488	1327616
8	ENCY	E05909	469004	8382	3907712	511488
8	ENCY	E05910	471104	8174	1327680	2138752
8	ENCY	E05911	466003	8306	1490176	2277504
8	ENCY	E05912	466103	8306	1490176	2277504
8	ENCY	E05915	398005	7020	3682176	298944
8	ENCY	E05916	470004	8606	519488	1327616
8	ENCY	E05917	472004	8487	2138816	2949888
8	ENCY	E05920	474004	7560	3761024	377792
8	ENCY	E05921	474104	7560	3761024	377792
8	ENCY	E05924	476104	8356	1188928	2000000
8	ENCY	E05925	477103	7834	2000064	2811072
8	ENCY	E05926	471004	8174	1327680	2138752
8	ENCY	E05927	472104	8487	2138816	2949888
8	ENCY	E05930	398105	7020	3682176	298944
8	ENCY	E05931	473005	7322	2949952	3760960
8	ENCY	E05932	473105	7322	2949952	3760960
8	ENCY	E05935	476004	8356	1188928	2000000
8	ENCY	E05936	478105	7747	2811136	3622208
8	ENCY	E05942	486004	8475	480064	1288064
8	ENCY	E05943	479105	7696	3622272	238848
8	ENCY	E05944	477003	7834	2000064	2811072
8	ENCY	E05945	480104	7267	239104	1050112
8	ENCY	E05946	481104	7626	1050176	1861184
8	ENCY	E05949	324005	6532	3363648	4171392
8	ENCY	E05950	325105	7226	4176832	791488
8	ENCY	E05951	480004	7267	239104	1050112
8	ENCY	E05952	482104	7418	1861248	2672320
8	ENCY	E05953	481004	7626	1050176	1861184
8	ENCY	E05954	483105	6311	2672384	3483392
8	ENCY	E05955	482004	7418	1861248	2672320
8	ENCY	E05956	483005	6311	2672384	3483392
8	ENCY	E05957	484105	6749	3483456	100224
8	ENCY	E05959	488104	8072	2102272	2913344
8	ENCY	E05961	484005	6749	3483456	100224
8	ENCY	E05962	487004	7011	1309632	2102208
8	ENCY	E05975	269105	8030	697344	1508416
8	ENCY	E05977	488004	8072	2102272	2913344
8	ENCY	E05979	489004	8061	2913408	3711872
8	ENCY	E05980	489104	8061	2913408	3711872
8	ENCY	E05986	490104	8409	3733632	341248
8	ENCY	E05987	491104	8149	341312	1134656
8	ENCY	E05988	490004	8409	3733632	341248
8	ENCY	E05989	492104	7676	1156160	1963456
8	ENCY	E05990	491004	8149	341312	1134656
8	ENCY	E05991	493104	7403	1963520	2774528
8	ENCY	E05999	493004	7403	1963520	2774528
8	ENCY	E06001	495003	8649	3589376	202496
8	ENCY	E06002	495103	8649	3589376	202496
8	ENCY	E06005	494003	8742	2774592	3584960
8	ENCY	E06006	494103	8742	2774592	3584960
8	ENCY	E06009	496004	8209	202560	1013568
8	ENCY	E06010	496104	8209	202560	1013568
8	ENCY	E06011	497104	8339	1015104	1824704
8	ENCY	E06013	497004	8339	1015104	1824704
8	ENCY	E06019	513103	7076	1408448	2219456
8	ENCY	E06021	500004	8063	3446976	63680
8	ENCY	E06022	502104	7316	874880	1685952
8	ENCY	E06023	410005	4522	846336	1602432

8	ENCY	E06024	411103	4882	1655104	2411072
8	ENCY	E06025	501004	8375	63744	874816
8	ENCY	E06026	503105	8406	1686016	2497024
8	ENCY	E06027	502004	7316	874880	1685952
8	ENCY	E06034	569104	7989	1294400	528768
8	ENCY	E06038	504105	8489	2497088	3308160
8	ENCY	E06039	503005	8406	1686016	2497024
8	ENCY	E06042	505004	9663	3308224	4119232
8	ENCY	E06043	507104	9391	736128	1543296
8	ENCY	E06044	403004	6365	3568256	148800
8	ENCY	E06045	403104	6365	3568256	148800
8	ENCY	E06046	506004	8549	4119296	736064
8	ENCY	E06047	509109	9214	2358336	3169344
8	ENCY	E06048	507004	9391	736128	1543296
8	ENCY	E06055	514104	8739	2219520	2996096
8	ENCY	E06056	448004	8563	3658048	260480
8	ENCY	E06058	421104	8265	1366144	2177152
8	ENCY	E06059	566004	6798	3055360	3865344
8	ENCY	E06062	511005	7919	3980544	597248
8	ENCY	E06063	534004	8221	1219840	1989440
8	ENCY	E06065	511105	7919	3980544	597248
8	ENCY	E06066	509009	9214	2358336	3169344
8	ENCY	E06068	522005	9964	319808	1130816
8	ENCY	E06069	512104	7618	597312	1408384
8	ENCY	E06070	377005	5999	214912	1025984
8	ENCY	E06071	512004	7618	597312	1408384
8	ENCY	E06072	377105	5999	214912	1025984
8	ENCY	E06075	514004	8739	2219520	2996096
8	ENCY	E06076	448104	8563	3658048	260480
8	ENCY	E06079	515004	9530	3033280	3841664
8	ENCY	E06080	515104	9530	3033280	3841664
8	ENCY	E06083	516104	9930	3841728	458496
8	ENCY	E06084	517104	8559	467648	1269632
8	ENCY	E06085	516004	9930	3841728	458496
8	ENCY	E06086	518104	8073	1276416	2078848
8	ENCY	E06087	517004	8559	467648	1269632
8	ENCY	E06088	519106	9137	2081024	2891840
8	ENCY	E06089	518004	8073	1276416	2078848
8	ENCY	E06090	520107	8381	2891904	3702912
8	ENCY	E06092	527004	6337	181056	536320
8	ENCY	E06094	520007	8381	2891904	3702912
8	ENCY	E06097	525004	9349	2753088	3564160
8	ENCY	E06103	521008	10588	3702976	319744
8	ENCY	E06104	523006	9580	1130880	1941952
8	ENCY	E06105	536105	6973	2833088	3606976
8	ENCY	E06106	535104	8467	2038784	2798272
8	ENCY	E06109	521108	10588	3702976	319744
8	ENCY	E06111	523106	9580	1130880	1941952
8	ENCY	E06113	519006	9137	2081024	2891840
8	ENCY	E06115	524104	8888	1942016	2753024
8	ENCY	E06116	525104	9349	2753088	3564160
8	ENCY	E06117	526104	8368	3564224	180992
8	ENCY	E06118	524004	8888	1942016	2753024
8	ENCY	E06119	527104	6337	181056	536320
8	ENCY	E06122	529105	8717	1347520	2158528
8	ENCY	E06126	522105	9964	319808	1130816
8	ENCY	E06127	526004	8368	3564224	180992
8	ENCY	E06128	528104	9503	536384	1347456
8	ENCY	E06133	528004	9503	536384	1347456
8	ENCY	E06135	530104	9162	2158592	2969664
8	ENCY	E06139	529005	8717	1347520	2158528
8	ENCY	E06141	530004	9162	2158592	2969664
8	ENCY	E06143	531004	8698	2969728	3780736
8	ENCY	E06144	531104	8698	2969728	3780736
8	ENCY	E06149	533003	7826	397632	1206528
8	ENCY	E06150	533103	7826	397632	1206528

8	ENCY	E06151	539104	8235	1077568	1881024
8	ENCY	E06153	510007	10033	3169408	3980480
8	ENCY	E06154	536005	6973	2833088	3606976
8	ENCY	E06164	535004	8467	2038784	2798272
8	ENCY	E06165	537005	7540	3642048	258752
8	ENCY	E06166	544104	7950	1988224	2799232
8	ENCY	E06167	537105	7540	3642048	258752
8	ENCY	E06170	534104	8221	1219840	1989440
8	ENCY	E06172	538003	7172	260224	1069888
8	ENCY	E06174	510107	10033	3169408	3980480
8	ENCY	E06177	538103	7172	260224	1069888
8	ENCY	E06178	540104	7716	1881088	2692096
8	ENCY	E06182	568004	6876	483264	1294336
8	ENCY	E06183	570104	5986	528832	1334208
8	ENCY	E06186	542105	7271	366016	1168896
8	ENCY	E06188	546004	8380	3610432	227136
8	ENCY	E06190	543104	7649	1179904	1988160
8	ENCY	E06191	542005	7271	366016	1168896
8	ENCY	E06193	543004	7649	1179904	1988160
8	ENCY	E06194	556004	8031	3332864	4126528
8	ENCY	E06196	545104	7709	2799296	3610368
8	ENCY	E06197	544004	7950	1988224	2799232
8	ENCY	E06198	546104	8380	3610432	227136
8	ENCY	E06201	545004	7709	2799296	3610368
8	ENCY	E06205	563105	6851	622016	1433088
8	ENCY	E06207	557104	8324	4146816	760768
8	ENCY	E06209	547005	7158	227200	1038272
8	ENCY	E06210	547105	7158	227200	1038272
8	ENCY	E06213	548005	6912	1038336	1849408
8	ENCY	E06214	548105	6912	1038336	1849408
8	ENCY	E06217	549105	8723	1849472	2659968
8	ENCY	E06218	549005	8723	1849472	2659968
8	ENCY	E06219	550003	8955	2686080	3471616
8	ENCY	E06220	550103	8955	2686080	3471616
8	ENCY	E06221	551004	8095	3471680	88384
8	ENCY	E06222	551104	8095	3471680	88384
8	ENCY	E06223	555104	9057	2521792	3332800
8	ENCY	E06224	556104	8031	3332864	4126528
8	ENCY	E06228	555004	9057	2521792	3332800
8	ENCY	E06229	553104	8283	900928	1696512
8	ENCY	E06231	554104	7369	1727552	2521728
8	ENCY	E06232	558105	8364	761600	1571840
8	ENCY	E06233	539004	8235	1077568	1881024
8	ENCY	E06234	541005	6595	2692160	365952
8	ENCY	E06235	540004	7716	1881088	2692096
8	ENCY	E06236	553004	8283	900928	1696512
8	ENCY	E06240	554004	7369	1727552	2521728
8	ENCY	E06241	552005	6661	88448	892032
8	ENCY	E06242	552105	6661	88448	892032
8	ENCY	E06245	541105	6595	2692160	365952
8	ENCY	E06246	557004	8324	4146816	760768
8	ENCY	E06248	559005	8373	1571904	2382976
8	ENCY	E06249	562104	6737	4005248	621952
8	ENCY	E06252	560104	6551	2383040	3194048
8	ENCY	E06254	561104	7691	3194112	4005184
8	ENCY	E06257	560004	6551	2383040	3194048
8	ENCY	E06259	561004	7691	3194112	4005184
8	ENCY	E06261	562004	6737	4005248	621952
8	ENCY	E06263	563005	6851	622016	1433088
8	ENCY	E06268	558005	8364	761600	1571840
8	ENCY	E06269	559105	8373	1571904	2382976
8	ENCY	E06271	564005	7511	1433152	2244224
8	ENCY	E06273	564105	7511	1433152	2244224
8	ENCY	E06274	565104	7804	2244288	3055296
8	ENCY	E06275	566104	6798	3055360	3865344
8	ENCY	E06276	567003	7525	3873216	483200

8	ENCY	E06278	565004	7804	2244288	3055296
8	ENCY	E06279	567103	7525	3873216	483200
8	ENCY	E06281	569004	7989	1294400	528768
8	ENCY	E06284	568104	6876	483264	1294336
8	ENCY	E06292	571104	6274	1352256	2150976
8	ENCY	E06293	570004	5986	528832	1334208
8	ENCY	E06295	572104	5667	2151040	2962048
8	ENCY	E06301	571004	6274	1352256	2150976
8	ENCY	E06302	573007	7607	2962112	3769856
8	ENCY	E06305	584005	7383	3495680	112448
8	ENCY	E06306	572004	5667	2151040	2962048
8	ENCY	E06307	573107	7607	2962112	3769856
8	ENCY	E06308	574106	6200	3778688	389952
8	ENCY	E06311	575104	6187	390016	1201088
8	ENCY	E06312	574006	6200	3778688	389952
8	ENCY	E06314	575004	6187	390016	1201088
8	ENCY	E06315	597004	7491	1457216	2264320
8	ENCY	E06316	576104	7241	1201152	2012160
8	ENCY	E06317	577104	9297	2012224	2820800
8	ENCY	E06318	577004	9297	2012224	2820800
8	ENCY	E06319	578105	7739	2825472	3633856
8	ENCY	E06320	576004	7241	1201152	2012160
8	ENCY	E06321	578005	7739	2825472	3633856
8	ENCY	E06322	584105	7383	3495680	112448
8	ENCY	E06329	579104	6851	3634496	250240
8	ENCY	E06331	579004	6851	3634496	250240
8	ENCY	E06333	580004	7624	255872	1062336
8	ENCY	E06334	580104	7624	255872	1062336
8	ENCY	E06335	581104	10050	1062400	1873408
8	ENCY	E06336	582104	9240	1873472	2684544
8	ENCY	E06337	581004	10050	1062400	1873408
8	ENCY	E06342	585104	8055	112512	923520
8	ENCY	E06343	582004	9240	1873472	2684544
8	ENCY	E06345	583004	9041	2684608	3495616
8	ENCY	E06346	583104	9041	2684608	3495616
8	ENCY	E06347	586104	8095	923584	1734656
8	ENCY	E06348	585004	8055	112512	923520
8	ENCY	E06349	587105	7467	1734720	2545792
8	ENCY	E06353	619003	6334	2594240	3328704
8	ENCY	E06358	586004	8095	923584	1734656
8	ENCY	E06362	587005	7467	1734720	2545792
8	ENCY	E06363	596004	7619	669056	1457152
8	ENCY	E06364	589005	7497	3356928	4168000
8	ENCY	E06365	589105	7497	3356928	4168000
8	ENCY	E06367	593003	7713	2407040	3218112
8	ENCY	E06368	590104	8013	4168064	784768
8	ENCY	E06372	590004	8013	4168064	784768
8	ENCY	E06374	588005	8569	2545856	3356864
8	ENCY	E06375	591005	7923	784832	1595776
8	ENCY	E06376	592104	8095	1625792	2406976
8	ENCY	E06377	591105	7923	784832	1595776
8	ENCY	E06379	592004	8095	1625792	2406976
8	ENCY	E06381	593103	7713	2407040	3218112
8	ENCY	E06382	594105	7025	3218176	4016832
8	ENCY	E06383	601004	7616	507328	1292992
8	ENCY	E06384	588105	8569	2545856	3356864
8	ENCY	E06385	595006	7839	4053312	628352
8	ENCY	E06386	601104	7616	507328	1292992
8	ENCY	E06387	599005	6812	3107456	3890432
8	ENCY	E06388	599105	6812	3107456	3890432
8	ENCY	E06392	594005	7025	3218176	4016832
8	ENCY	E06393	596104	7619	669056	1457152
8	ENCY	E06394	597104	7491	1457216	2264320
8	ENCY	E06395	598104	7112	2298560	3052160
8	ENCY	E06398	595106	7839	4053312	628352
8	ENCY	E06405	598004	7112	2298560	3052160

8	ENCY	E06406	600104	6139	3890496	507264
8	ENCY	E06409	602004	7385	1340032	2031552
8	ENCY	E06410	602104	7385	1340032	2031552
8	ENCY	E06412	614103	4331	2708480	3473984
8	ENCY	E06415	603104	7705	2149760	2940544
8	ENCY	E06416	600004	6139	3890496	507264
8	ENCY	E06417	604105	8082	2940608	3751680
8	ENCY	E06418	603004	7705	2149760	2940544
8	ENCY	E06419	604005	8082	2940608	3751680
8	ENCY	E06422	605104	8763	3751744	358464
8	ENCY	E06423	606105	7738	368704	1178880
8	ENCY	E06426	605004	8763	3751744	358464
8	ENCY	E06427	606005	7738	368704	1178880
8	ENCY	E06430	607004	6404	1199616	1989952
8	ENCY	E06431	607104	6404	1199616	1989952
8	ENCY	E06432	608104	6855	2008576	2800384
8	ENCY	E06433	609005	5828	2876160	3611456
8	ENCY	E06434	608004	6855	2008576	2800384
8	ENCY	E06435	609105	5828	2876160	3611456
8	ENCY	E06442	610104	6701	3668096	228992
8	ENCY	E06444	610004	6701	3668096	228992
8	ENCY	E06446	611004	6117	282304	1033984
8	ENCY	E06447	611104	6117	282304	1033984
8	ENCY	E06449	613003	7691	1898112	2661568
8	ENCY	E06450	613103	7691	1898112	2661568
8	ENCY	E06453	612003	6668	1090496	1840768
8	ENCY	E06454	612103	6668	1090496	1840768
8	ENCY	E06455	615006	6493	3513280	4992
8	ENCY	E06456	614003	4331	2708480	3473984
8	ENCY	E06457	620004	7677	3371264	4135360
8	ENCY	E06459	618005	5218	1747648	2511808
8	ENCY	E06462	647004	4379	69440	880512
8	ENCY	E06465	615106	6493	3513280	4992
8	ENCY	E06466	621006	6398	4192064	730752
8	ENCY	E06470	620104	7677	3371264	4135360
8	ENCY	E06471	622005	6109	802752	1539904
8	ENCY	E06473	618105	5218	1747648	2511808
8	ENCY	E06474	617010	6259	1008192	1698880
8	ENCY	E06478	619103	6334	2594240	3328704
8	ENCY	E06481	622105	6109	802752	1539904
8	ENCY	E06482	621106	6398	4192064	730752
8	ENCY	E06483	623105	7351	1591872	2365824
8	ENCY	E06489	625105	6212	3196672	4007680
8	ENCY	E06490	623005	7351	1591872	2365824
8	ENCY	E06491	624104	7011	2386688	3196608
8	ENCY	E06492	626106	5036	4007744	624384
8	ENCY	E06495	616006	6892	130368	869120
8	ENCY	E06496	616106	6892	130368	869120
8	ENCY	E06497	624004	7011	2386688	3196608
8	ENCY	E06498	625005	6212	3196672	4007680
8	ENCY	E06503	626006	5036	4007744	624384
8	ENCY	E06505	627004	4988	624640	1435584
8	ENCY	E06506	627104	4988	624640	1435584
8	ENCY	E06507	628104	5675	1435648	2246720
8	ENCY	E06508	629104	5632	2246784	3057792
8	ENCY	E06509	628004	5675	1435648	2246720
8	ENCY	E06510	630104	4840	3057856	3868800
8	ENCY	E06515	636105	6663	3730240	332864
8	ENCY	E06516	644005	7127	1839232	2641472
8	ENCY	E06517	632005	2746	485760	1296832
8	ENCY	E06518	638003	6114	1190656	1966080
8	ENCY	E06519	629004	5632	2246784	3057792
8	ENCY	E06520	632105	2746	485760	1296832
8	ENCY	E06521	630004	4840	3057856	3868800
8	ENCY	E06523	633005	4372	1296896	2107904
8	ENCY	E06524	634104	5628	2108032	2919040

```
8  ENCY E06525     635106   8045        2919104    3730176
8  ENCY E06528     633105   4372        1296896    2107904
8  ENCY E06529     631004   4765        3873216     485696
8  ENCY E06530     631104   4765        3873216     485696
8  ENCY E06533     634004   5628        2108032    2919040
8  ENCY E06535     635006   8045        2919104    3730176
8  ENCY E06539     636005   6663        3730240     332864
8  ENCY E06541     640004   4167        2785792    3591360
8  ENCY E06545     637104   5657         389440    1157312
8  ENCY E06547     637004   5657         389440    1157312
8  ENCY E06549     638103   6114        1190656    1966080
8  ENCY E06550     639104   6253        1985856    2773952
8  ENCY E06551     644105   7127        1839232    2641472
8  ENCY E06552     640104   4167        2785792    3591360
8  ENCY E06553     645006   7659        2641536    3452608
8  ENCY E06554     641104   4613        3591424     208192
8  ENCY E06556     641004   4613        3591424     208192
8  ENCY E06557     639004   6253        1985856    2773952
8  ENCY E06558     651105   7346        3314176    4124928
8  ENCY E06559     649003   7993        1691712    2502720
8  ENCY E06563     642005   5863         208256    1019264
8  ENCY E06564     642105   5863         208256    1019264
8  ENCY E06565     643105   7542        1019328    1813504
8  ENCY E06567     648104   7187         880576    1691648
8  ENCY E06569     643005   7542        1019328    1813504
8  ENCY E06570     649103   7993        1691712    2502720
8  ENCY E06574     647104   4379          69440     880512
8  ENCY E06576     645106   7659        2641536    3452608
8  ENCY E06582     653004   8044         741824    1552832
8  ENCY E06583     652004   8310        4124992     741760
8  ENCY E06584     648004   7187         880576    1691648
8  ENCY E06587     646006   7567        3452672      69376
8  ENCY E06588     646106   7567        3452672      69376
8  ENCY E06589     650104   8650        2502784    3313792
8  ENCY E06590     651005   7346        3314176    4124928
8  ENCY E06591     650004   8650        2502784    3313792
8  ENCY E06592     652104   8310        4124992     741760
8  ENCY E06595     653104   8044         741824    1552832
8  ENCY E06604     654004   8265        1552896    2363968
8  ENCY E06605     654104   8265        1552896    2363968
8  ENCY E06606     655001   2936        2364032    2572352
8  ENCY E06607     655101   2936        2364032    2572352
8  ENCY E06609     655003   3615        2364032    2807808
8  ENCY E06610     655103   3615        2364032    2807808
8  TOTAL RECORDS =              9863245   RECL     2812
                  I8 BYTES, MBYTE        2.7735E+10      2.6451E+04
8  TOTAL RECORDS (1984 ->) =              4389101   RECL     2812
                  I8 BYTES, MBYTE        1.2342E+10      1.1770E+04
```

Pioneer PHA, RATE tapes

Word	Content
24-67	Repeat Words 22-23 for SCID 1-22
68	Data Quality Indicator and GMT of SCID 23 (see Word 22)
69	0(MSB) 31(LSB) 0000000000XXXXXX | 0000XXXXXXXXXXXXXX S/CE-1,24 14 15 16 17
70-81	Repeat Words 68-69 for SCID 24-29 (contains S/CE-1,25 - S/CE-1,30 respectively)
82-149	Repeat Words 22-23 for SCID 30-63
150-277	Repeat Words 22-149 for SCID 64-127
278-130T	Repeat Words 22-277 for 4 additional Subcom sequences (SCID 0-127)

5.1.2 PHA Tapes

5.1.2.1 Description

The PHA tapes are 9-track 1600 BPI tapes with standard OS/360 labels written in the binary mode and odd parity. The data set name is PIOPHA. They contain variable length blocked records with a maximum buffer length (BLKSIZE) of 7624 bytes and a maximum logical record length (LRECL) of 1524 bytes. These tapes contain the time-ordered Pioneer GSFC/CRT Pulse Height Analysis (PHA) data, corresponding events per second (RATES) data and related spacecraft information. Each logical record contains selected spacecraft information and all the PHA data and associated RATES data for one or more pages (each page represents a fourth of an experiment cycle). Each PHA event for the HET and LET requires 3 halfwords (48 bits) and these bits are organized in the 3 halfwords for the HET and LET events as follows:

	0(MSB) 15(LSB)
Halfword 1	METTAAAAAAAAAAAA
Halfword 2	BBBBBBBBBBBBCCCC
Halfword 3	CCCCCCCCRSSSQPPN

where: M = 0 Good data

= 1 Missing/padded data

E = 0 LET event

= 1 HET event

TT = 00 $A_1\overline{A}_2BCIII$ (HET) / $DIDIII\Sigma D\overline{F}$ (LET)

= 01 A_2BCIII (HET) / $DIDII\overline{F}$ (LET)

= 10 $(A_2K_1+A_1CI)B\overline{CIII}$ (HET) / (No LET)

= 11 $A_1BK_2\overline{CIII}$ (HET) / (No LET)

A, B, C = Amplitudes from detectors A, B, and C respectively

R = 0 CII threshold not exceeded } HET only

= 1 CII threshold is exceeded } HET only

SSS = 0-7 Sectors 0-7 respectively

Q = 0-Priority indicators valid

= 1 Priority indicators-questionable

PP = 0-3 Priorities 0-3 (HET) / 0-1 (LET)

N = 0 Good event

= 1 Null event

5.1.2.2 Logical Record Format

Displacement	Type	Description
0	I*4	Time of day (MS) for first page contained in record.

Displacement	Type	Description
4	I*4	Time of day (MS) for page which is expected to immediately follow the last page in this record.
8	I*2	Day (RMJD) for first page contained in record.
10	I*2	Day (RMJD) for page which is expected to immediately follow the last page in this record.
12	I*2	Absolute File Number
14	I*2	Time correction flag (0 - no correction, 7 - suspect time or corrected time)
16	I*2	Number of pages (1/4 experiment cycle) included in record (maximum of 6 for Format A and 5 for Format B)
18	I*2	Bit rate (1-16, 2-32, 3-64, 4-128, 5-266, 6-512, 7-1024, 8-2048)
20	I*2	Format (1-A, 2-A/D, 3-B, 4-B/D)
22	I*2	Mode (0 or 1 - real time, 2 or 3 - memory readout, 4 or 5 - telemetry store)
24	I*2	DSS identification
26	I*2	Extended frame counter (ESC Subcom ID)
28	I*2	RAT flag (Roll attitude timer) (0 - good value, 1 - old value, 2 - missing value, 3 - corrected value)
30	I*2	ASPNPDC flag (Spin period) (see RAT flag for description)
32	I*2	SPF flag (Spin period flag) (see RAT flag for description)

Displacement	Type	Description
34	I*2	ARIPPHEC flag (Roll pulse/Roll-index pulse phase error) (see RAT flag for description)
36	R*4	Roll attitude timer (RAT) (One million equals pad)
40	R*4	Spin period (ASPNPDC) (One million equals pad)
44	R*4	Roll pulse/Roll-index pulse phase error (ARIPPHEC) (One million equals pad)
48	I*2	Spin Period Sector Generator (SPSG) roll reference (0 = 0°, 1 = 180°)
50	I*2	Spin Period Sector Generator (SPSG) mode (0 - Non-Spin averaging, 1 - ACS, 2 - Sping averaging)
52	I*4	Roll attitude time (MS of RAT) (a negative one indicates value is missing)
56	R*4	DC Bus Voltage (One million equals pad)
60	R*4	DC Bus Current (One million equals pad)
64	R*4	Spacecraft Platform Temperature (One million equals pad)
68	R*4	Signal to noise ratio (SNR) (One million equals pad)
72	I*2	Bits 4 and 5 from engineering word C-431. (0=error, 1=locked on star, 2=Sum B sensor, 3=Sum A sensor)
74	I*2	Star Delay Counter in Data Numbers (conversion algorithm to be defined bv ARC)
76	I*2	Day (RMJD) of RAT
78	I*2	Sectored Rates indicator (0-Not Inhibited, 1-Inhibited)
80	I*2	All the Subcom data associated with the first page of data contained in the record. Refer to Tables 5.1 and 5.2 for a description of the Subcom data for Format A and Format B respectively.

Displacement	Type	Description
N1	I*4	All the rates data associated with the first page of data contained in record. The rates data associated with each page appears in eight consecutive words as follows: (1)HET Rate R1 - $(A_2K_1+A_1CI)B\overline{CIII}$ (2)HET Rate R1 - $(A_2K_1+A_1CI)B\overline{CIII}$ (3)HET Rate R2A - $A_1\overline{A}_2BCIII$ (4)HET Rate R2B - $A_1BK_2\overline{CIII}$ (5)HET Rate R3A - A_2BCIII (6)LET Rate R11A - DI DII $\overline{F}$ (7)LET Rate R11B - DI DII $\Sigma\overline{DF}$ (8)Computed HET Rate R1 - (R6B+R7A+R7B+R8A+R8B) All rates which fail the Trend Check will be indicated by a negative rate value. Whenever a rate with the value of zero fails the Trend Check, it will be indicated by the value, -21000000. Padded rates will be indicated by the value, -20000000. N1 = 96 - Format A = 112 - Format B
N2	I*2	All the PHA data associated with the first page of data contained in record. Each PHA entry, comprised of a HET and LET event, has a unique time associated with it and appears in three consecutive words as follows: 0 (MSB) 31 (LSB) (1) |HET - 1 | HET - 2| (2) |HET - 3 | LET - 1| (3) |LET - 2 | LET - 3| Padded data is indicated by a negative first halfword for an HET or LET event. There are 16 PHA entries, comprised of an HET and LET event, per page for Format A and 8 PHA entires per page for Format B. N2 = 128 - Format A = 144 - Format B

Displacement	Type	Description
N3		All the Subcom, Rates and PHA data for the second page of data contained in the record (see description of first page). N3 = 320 - Format A = 240 - Format B
N4		Third page of data N4 = 560 - Format A = 400 - Format B
N5		Fourth page of data N5 = 800 - Format A = 560 - Format B
N6		Fifth page of data N6 = 1040 - Format A = 720 - Format B
1280		Sixth page of data (Format A only)

5.1.3 RATES Tape

5.1.3.1 Description

The RATES tapes are ~~7~~ 9-track ~~800~~ 1600 BPI tapes with standard OS/360 labels written in the binary mode and odd parity, ~~with coversion.~~ The data set name is PIORAT. They contain variable length blocked records with a maximum buffer length (BLKSIZE) of 8704 bytes and a maximum logical record length (LRECL) fo 1740 bytes. These tapes contain the time-ordered Pioneer GSFC/CRT Events per second (RATES) data and related spacecraft information. Each logical record contains selected spacecraft information and all the RATES data for one or more pages (each page represents one fourth of an experiment cycle). All rates which fail the Trend Check will be indicated by a negative rate value.

Whenever a rate with the value of zero fails the Trend Check, it will be indicated by the value, -21000000. Padded rates data will be indicated by the value, -20000000.

5.1.3.2 Logical Record Format

Displacement	Type	Description
0	I*4	Time of day (MS) for first page contained in record.
4	I*4	Time of day (MS) for page which is expected to immediately follow the last page in this record.
8	I*2	Day (RMJD) for first page contained in record.
10	I*2	Day (RMJD) for page which is expected to immediately follow the last page in this record.
12	I*2	Absolute File Number
14	I*2	Time correction flag (0 - no correction, 7 - suspect time or corrected time)
16	I*2	Number of pages (1/4 experiment cycle) included in record (maximum of 6 for Format A and 5 for Format B).
18	I*2	Bit rate (1-16, 2-32, 3-64, 4-128, 5-256, 6-512, 7-1024, 8-2048)
20	I*2	Format (1-A, 2-A/D, 3-B, 4-B/D)
22	I*2	Mode (0 or 1 - real time, 2 or 3-memory readout, 4 or 5 - telemetry store)
24	I*2	DSS identification
26	I*2	Extended frame counter (ESC Subcom ID)
28	I*2	RAT flag (Roll attitude timer) (0-good value, 1-old value, 2-missing value, 3-corrected value)
30	I*2	ASPNPDC flag (Spin period) (see RAT flag for description)
32	I*2	SPF flag (Spin period flag) (see RAT flag for description)

Displacement	Type	Description
34	I*2	ARIPPHEC flag (roll pulse) Roll-index pulse phase error) (see RAT flag for description)
36	R*4	Roll attitude timer (RAT) (One million equals pad)
40	R*4	Spin period (ASPNPDC) (One million equals pad)
44	R*4	Roll pulse/Roll-index pulse phase error (ARIPPHEC) (One million equals pad)
48	I*2	Spin Period Sector Generator (SPSG) roll reference (0=0°, 1=180°).
50	I*2	Spin Period Sector Generator (SPSG) mode (0-Non-Spin averaging, 1-ACS, 2-Spin averaging)
52	I*4	Roll attitude time (MS of RAT) (-1 indicates value is missing)
56	R*4	DC Bus Voltage (One million equals pad)
60	R*4	DC Bus Current (One million equals pad)
64	R*4	Spacecraft Platform Temperature (One million equals pad)
68	R*4	Signal to noise ratio (SNR) (One million equals pad)
72	I*2	Bits 4 and 5 from engineering word C-431. (0=error, 1=locked on star, 2= Sum B sensor, 3=Sum A sensor)
74	I*2	Star Delay Counter in Data Numbers (conversion algorithm to be defined by ARC)
76	I*2	Day (RMJD) of RAT
78	I*2	Sectored Rates indicator (0=Not Inhibited, 1=Inhibited)
80	I*2	All the Subcom data associated with the first page of data contained in the record. Refer to Tables 5.1 and 5.2 for a description of the Subcom data for Format A and Format B respectively.

Displacement	Type	Description
N1	I*4	All the rates data associated with the first page of data contained in record. Each page consists of 4 sets (2 sectored and 2 unsectored) of 16 rates which are uniquely identified by the corresponding rate sequence I. D. 's appearing in the associated set of Subcom data. The rates data associated with each page appears in 64 consecutive words as follows: 1 - Sectored Rate (First set) ⋮ 16 - Sectored Rate (First set) 17 - Unsectored Rate (First set) ⋮ 32 - Unsectored Rate (First set) 33 - Sectored Rate (Second set) ⋮ 48 - Sectored Rate (Second set) 49 - Unsectored Rate (Second set) ⋮ 64 - Unsectored Rate (Second set) Refer to Table 5.3 to determine the rates data associated with each unsectored and sectored rate sequence I. D. Note: Redundant sectored rates data occurs whenever the corresponding sectored rate sequence I. D. is not updated from previous value. N1 = 100 - Format A = 112 - Format B
N2		All the Subcom and Rates data for the second page of data contained in the record (see description of first page). N2 = 356 - Format A = 368 - Format B

Displacement	Type	Description
N3		Third page of data N3 = 632 - Format A = 656 - Format B
N4		Fourth page of data N4 = 908 - Format A = 944 - Format B
N5		Fifth page of data N5 = 1184 - Format A = 1232 - Format B
1460		Sixth page of data (Format A only)

5.1.4 CATALOG Tapes

5.1.4.1 Description

The CATALOG tapes are 9-track 1600 BPI tapes with standard OS/360 labels written in the binary mode and odd parity. The data set name is PIOCAT. They contain variable length blocked records with a maximum buffer length (BLKSIZE) of 7292 bytes and a maximum logical record length (LRECL) of 7288 bytes. These tapes contain a backup copy of the associated DRS Tape Catalog on the first file, and files two through four contain the time-ordered Logistics, Command and Attitude information related to the Pioneer F/G missions, respectively.

The Logistics, Command and Attitude data sets (separate CATALOG tape files) are treated as three separate catalogs. Within each catalog, the information associated with an Absolute File (all the data for a particular day processed from the same EDR tape) is stored in sequential groups of records (one or more). A unique number is assigned to each absolute file called the Absolute File Number and is used to identify the

Pioneer

2. FLUX Tape Description

The Flux tape combines RATES and PHA data into 15-minute summaries called volumes. Each volume is assigned a file number, with file number 1 corresponding to January 1 of the base year of 1972, zero hours, minutes, and seconds. Each volume contains 8 records of information as follows:

Record Number	Description
1	Rate Summary Record (see Table 2)
2	PHA Summary Record (see Table 3)
3	PHA Event Record for LET-0 (see Figure 3)
4	PHA Event Record for LET-1
5	PHA Event Record for HET-0
6	PHA Event Record for HET-1
7	PHA Event Record for HET-2
8	PHA Event Record for HET-3

Note that records 1 and 2 are fixed in length, while records 3 through 8 are variable in length, up to 3200 bytes. Also note that in order to read the next volume, all 8 records in the current volume must be read.

The Flux tapes are standard label tapes cataloged in the Flux Catalog.

The data control block (DCB) parameters are as follows:

DCB = (RECFM=VB, LRECL=32008, BLKSIZE=32012)

When running in the normal or update mode of operation, 1100 blocks are written per Flux tape. When running in the replace/insert mode of operation, 1150 blocks per tape are written.

Table 2. Rate Summary Record Structure

Word	Length (Bytes)	Type	Name	Description
0	2	I	HYRC	Year of the volume
	2	I	HMONC	Month of the volume
1	2	I	HDAYC	Day of the volume
	2	I	HHRC	Hour of the volume
2	2	I	HMINC	Minute of the volume
	2	I	HSFCC	Second of the volume
3	2	I	H11	Last sectored sequence ID
4	2	I	HMDAYC	Modified Julian day
5	4	I	MSECC	Milliseconds of the day
6	4	I	MSTIME	Missing times Note that if MSTIME=15, the next 7 records are skipped.
7	4	R	ISR1(9,4)	Total counts for sectored rate R1
8	4	R	ISR2(9,8)	Total counts for sectored rate R2
9	4	R	ISR3(9,8)	Total counts for sectored rate R3
10	4	R	ISXRY(9)	Total counts for sectored X-ray
11	4	R	IUR(64)	Total counts for unsectored X-ray
12	4	R	TSR1(9,4)	Accumulation times for ISR1 rates
13	4	R	TSR2(9,8)	Accumulation times for ISR2 rates
14	4	R	TSR3(9,8)	Accumulation times for ISR3 rates
15	4	R	TSXRY(9)	Accumulation times for sectored X-ray rates
16	4	R	TUR(64)	Accumulation times for unsectored rates
17	4	I	ISCOM	Accumulated subcom data values
18	2	I	HRCOM	Subcom data accumulation time

Table 3. PHA Summary Record Structure

Word	Length (Bytes)	Type	Name	Description
0	4	I	ISMSH	Start milliseconds of day of the volume
1	2	I	HSDYN	Start time of volume in modified Julian day
	2	I	HEDYH	End day of volume in modified Julian day
2	4	I	IEMSH	End milliseconds of day of the volume
3	4	I	NRECH	Record number
4	4	I	ITRATE(7)	Total accumulation times (six event type rates plus computed R1)
5	4	I	NRATES(7)	Total number of events (six event types plus computed R1)
6	4	I	NULLE (2,4,13)	Priority null events
7	4	I	NGOODE (6,4,13)	Non-null events

The following defines the structure of the PHA Events Record for record number 3 (LET-0).

Length (Bytes)	Type	Name	Description
4	I	NSEVNT	Number of LET-0 events
2	I	H(5, 4800)	Array of event values (in hexadecimal)

The first dimension of the array H denotes 10 bytes of information for each event value. These bytes contain the following:

Byte	Description
0, 1	PHA3 value
2, 3	PHA1 value
4, 5	PHA2 value
6	Sector ID
7	CII threshold (HET only)
8	Priority (Pioneer only)
9	Priority mode

The structure of the PHA Events Record for record numbers 4 through 8 (LET-1, HET-0, HET-1, HET-2, and HET-3, respectively) is identical to that defined above for LET-0.

Figure 3. PHA Events Record Structure

Voyager ENCY Format
SRD

LIBRARY ORGANIZATION

The library consists of encyclopedias.

Encyclopedia is organized into volumes.

Each volume is defined by a fifteen-minute interval that starts at integral fifteen-minute boundary, i.e., on the hour, fifteen minutes after the hour, thirty minutes after the hour, and forty-five minutes after the hour. The clock used for the purpose of determining time is the Universal time at the spacecraft. Each volume is assigned a unique number which is the number of fifteen-minute intervals elapsed before the volume since the start of calendar year 1977. A volume comprises of an integral number of instrument subcom sequences, and therefore may contain experiment data for a time interval which differs from the time interval of the volume by as much as one subcom sequence. A volume begins with an introduction which identifies the volume and provides information regarding volume contents. Following the introduction, there may be one or more chapters.

A chapter contains data obtained under the same instrument conditions (status, analog), and begins with an introduction. The introduction identifies the chapter and provides a general description of chapter contents, and conditions that may have led to the creation of this chapter. A chapter is terminated when either a change in experiment status occurs, or there is a gap in the data. Chapter introduction identifies the actual start-time and end-time of data included in the chapter. A number of verses follow the chapter introduction.

A verse contains all data of a specified type that was acquired within the time span covered by the chapter. Each verse begins with a preface that identifies the verse as belonging to a particular chapter of a volume and describes the type of data contained in the verse. The data follows the preface in a format appropriate to the type of data.

0.0 VOLUME INTRODUCTION

Byte	Length	Name	Description
0	1	VOCHPN	Chapter number (≡0)
1	1	VOVERN	Verse number (≡0)
2	1	EPV	Encyclopedia Program Version
3	1	SCID	Satellite Identification
4	4	VOVOLN	Volume number
8	6	EPDT	Encyclopedia Program Date
8	2	EPYR	(Year - 1900)
10	2	EPMN	Month of year
12	2	EPDY	Day of month
14	6	VCDT	Volume Creation Date
14	2	VCYR	(Year - 1900)
16	2	VCMN	Month of year
18	2	VCDY	Day of month
20	10	VSTRT	Time of Volume (Start Time)
20	2	VSYR	(Year - 1900)
22	2	VSMN	Month of year
24	2	VSDY	Day of month
26	2	VSHR	Hour of day
28	2	VSMN	Minute of hour
30	2		Spare
→ 32	2	NMCHP	Number of chapters in the volume (may be zero)
→ 34	52	APRMV	Twenty-six 2-byte fields, one for each of the analog parameters, that define acceptable range of variation of the parameters. Byte 0 - minimum acceptable value 1 - maximum acceptable value For parameters for which a percentage change is acceptable, byte 0 is set =255, and byte 1 contains acceptable variation, in parts per 256.

Byte	Length	Name	Description
→ 86	8	CHSMC	Subject matter code for each of the chapters in the volume. One byte field identifies each of the chapters in the volume according to the following code: Bit 0 - 0-nominal conditions wrt status 1-other conditions wrt status 1 - 0-real data 1-calibration data 2 - 0-analog parameters within tolerance 1-unusual (perhaps unacceptable) values of analog parameters 3 - 0-no time gap 1-time gap in data 4 - 0-no change in mode 1-change in S/C data mode 5-7 Spare bits
→ 94	1	DQAON	Data quality acceptance ON mask
→ 95	1	DQAOF	Data quality acceptance OFF mask
→ 96-99	4		Spare

n.0 CHAPTER INTRODUCTION n≥1

Byte	Length	Name	Description
0	1	CHCHPN	Chapter Number (≥1)
1	1	CHVERN	Chapter Verse Number - 0
2	1		Spare
3	1	CCHSMC	Subject Matter Code
4	4	CHVOLN	Volume Number

Byte	Length	Name	Description
8	8	DTSTRT	Starting S/C time of data included
8	2	DTYR	Year - 1900
10	2	DTHR	Hour of year
12	2	DTSC	Second of hour
14	2	DTMSC	Millisecond of second
16	8	DTEND	Ending S/C time of data
16	2	ENDYR	Year - 1900
18	2	ENDHR	Hour of year
20	2	ENDSC	Second of hour
22	2	ENDMSC	Millisecond of second
24	8	FDSCTR	Start FDS Count
24	2		Spare
26	2	CTR16	2^{16} Counter
28	2	CTR60	Mod 60 Counter
30	2	CTRLIN	Line count
32	2	DMOD	Format code of data in this chapter
34	2	NMVER	Number of verses in this chapter
36	100	CHCN	Chapter Contents Table nth byte of this field points to the verse containing nth type of data
136	2	CMDF	0 - no command received 1 - command received
138	2	CMD	Command text
140	32	STAT	Status words 0-15 that define chapter contents. Low order 12 bits of each 16-bit word contain status word. The structure of high order 4 bits follows:

Byte	Length	Name	Description
			Bit 0 PN error outside BET 0 - none 1 - bit errors exceed BET
			Bit 1 Valid data flag 0 - valid 1 - no data
			Bit 2 GCF Block error 0 - no 1 - yes
			Bit 3 0 - status read out in this chapter 1 - status inferred
172	48	AMX	Analog parameters (MUX) low order byte - value high order byte 0 - value read out in this chapter 1 - value inferred 2 - value not available
220	2	TTMP	Telescope temperature (format as with AMX)
222	2	ETMP	Electronics temperature (format as with AMX)
224-227	4		Spare

n. m VERSE (n, m≥1)

Verse Preface (Length = 8 bytes)

Byte	Name	Description
0	VECHPN	Chapter number
1	VEVERN	Verse number
2		Spare

Byte	Name	Description
3	VESMC	Subject matter code - Data Type (See Table 1.)
4-7	VEVOLN	Volume number
8-11		Spare
12		Verse body - Data

PREVERSE = offset of data = 12

Data Type 0 - Raw Rates Data

	Name	Description	Length (bytes)
PREVERSE+0	CMPS	Commutator position for the first set of rate readouts	1
+1	CMPS	Commutator position for the first set of rate readouts	1
+2	GAIN1	HET1 gain mode for the first set of readouts (0=low gain; 1=high gain)	1
+3	GAIN2	HET2 gain mode	1
+4	AUTO1	HET1 automatic gain switching (0=yes; 1=no)	1
+5	AUTO2	HET2 automatic gain switching	1
+6	NSEQ	Number of rate sequences in the verse	2
+8	RATE	30*NSEQ rate words in the format in Table 3	

Data Type 1 - Coincidence Condition Map (Length = 112 bytes)

PREVERSE+0	CCM	One 16-bit word for each of the first 53 rates in Table. Each word indicates the presence of terms in coincidence condition applicable to the corresponding rate.

Data Type 1 (continued)

	Name	Description	Length (bytes)
PREVERSE+106		Spare	6

Data Type 2 - Rate Summary

PREVERSE+0	RSM	135 rate summary blocks (16 bytes each) corresponding to the rates in Table 5	135x16

Data Type 3 - PHA History

PREVERSE+0	NUMPHA	Number of PHA events in this chapter	4
+4		Spare	
+8	EVNTYP	One byte field for each of the 16 PHA events that preceded the first PHA event in this chapter. Each byte contains the data type of the corresponding event. In the event of data discontinuity between previous volume and the current volume, these fields are padded.	16
+24		One byte field for each event in this chapter. Byte contains data type of the event. (Padded=all bits on; Null event=all bits off) Record filled to double-word boundary.	

Data Types 4-26

PREVERSE+0	PHARAT	Rate summary block for the corresponding rate	16
+16	PHAEV	Number of events corresponding to data type	4
+20		Spare	4
+24	PHA	PHA events; 8-byte entry for each event in the format in Table 6	

PHA FLAGS

TABLE 1. DATA TYPES

Code	Description			
0	Raw rates			
1	Coincidence condition map			
2	Rate Summary			
3	PHA History			
4	HET-I AS	11	II	IA2
5	HET-I ASZ3	12		IA3
6	HET-I BSZ2	13		IB2
7	HET-I BSP	14		IB3
8	HET-I BSE	15		
9	HET-I PENL	16		
10	HET-I PENH	17		
11-17	HET-II corresponding to 4-10			
18	LET-A $\overline{Z3}$*			
19	LET-A Z3			
20	LET-B $\overline{Z3}$*			
21	LET-B Z3			
22	LET-C $\overline{Z3}$*			
23	LET-C Z3			
24	LET-D $\overline{Z3}$*			
25	LET-D Z3			
26	TET			
27	UNKNOWN			

	¬G2	G1.¬G3	
¬G1.¬G2.¬G3	T	F	
G1.¬G2.¬G3	T	T	
G1, G2, ¬G3	F	T	
¬G1,¬G2.G3	F	F	

TABLE 2. BIT ASSIGNMENTS FOR COINCIDENCE CONDITION MAP

Bit	HET	LET	TET
0	A_1	L_1	W_1
1	A_2	L_2	W_2
2	C_1	L_3	D_{3L}
3	C_2	L_4	D_4
4	C_3	SL	$D_5 \equiv 1$
5	C_4	0	$D_6 \equiv 1$
6	B_2	0	D_7
7	B_1	0	D_8
8	SA	0	GA
9	SB	0	GB
10	G_1	0	U_T
11	G_2	0	0
12	G_3	0	0
13	0	0	0
14	0	0	0
15	0	0	0

1 in a bit position implies that corresponding term is present. Whether coincidence/anti-coincidence is determined by the rate definitions.

Bit 15 is set if the data type is disabled.

TABLE 3. RATE WORD FORMAT

Byte	Bit	Description
0	0	Fill data flag (0=no fill; 1=fill)
	1	PN error outside BET (0=none; 1=bit errors exceed BET)
	2	Valid data flag (0=valid; 1=no data)
	3	GCF Block error (0=no; 1=yes)
	4	Trend-check indicator 0 = readout follows trend 1 = readout does not follow trend
	5-7	Spare
1-3		Decompressed Rate Counts

TABLE 4. RATE SUMMARY BLOCK FORMAT

Byte	Description
0-3	Accumulated counts for this rate, excluding readouts which (a) appeared in a minor frame for which bit errors exceeded tolerance, or (b) failed trend check.
4-7	Time in seconds over which the counts above were accumulated.
8-11	Accumulated counts for this rate, excluding readouts for which data quality was unacceptable or gain mode was unavailable.
12-15	Time in seconds over which the counts in the preceding word were accumulated.

TABLE 5. LOCATION OF RATE SUMMARY BLOCKS IN RATE SUMMARY TEXT

1	AS ~~HG~~	51	TAN	101	SLB
2	ASZ3 ~~LG~~	52	TLO	102	$LA_1 LA_2 LA_3 \overline{LA}_4$
3	BSZ2 LG	53	THI	103	$LB_1 LB_2 LB_3 \overline{LB}_4$
4	BSp HG	54	A1H	104	LB_1
5	~~BSZ2~~ BSe	55	A2H	105	LB_2
6	PENH	56	C1H	106	LB_3
7	PENL ~~MATRIX~~ HET FLAGS	57	C2H	107	LB_4
8	PGH	58	B1H	108-119	LETC, LETD (corresponding to 96-107)
9	PGL	59	SBH		
10	BS4e	60	C3H	120-135	TET singles
11	BS4p	61	C4H		D6L
12	$BS4\overline{Z2}$	62	B2H		GA+GB
13	BS4Z2	63	G1		D5H
14	BS3e	64	A1L		D7L
15	BS3p	65	A2L		D6H
16	$BS3\overline{Z2}$	66	C1L		D7H
17	BS3Z2	67	C2L		D5L
18	BS2e	68	B1L		D8L
19	BS2p	69	SA1		D1H
20	$BS2\overline{Z2}$	70	SA2		D4H
21	BS2Z2	71	SBL		D2L
22-42	HET-II (corresponding to 1-21)	72	C3L		D3L
		73	C4L		D1L
43	$LA\overline{Z3}$	74	B2L		D3H
44	LAZ3	75-95	HET-II (corresponding to 54-74)		D2H
45	$LB\overline{Z3}$				D4L
46	LBZ3	96	LA_1		
47	$LC\overline{Z3}$	97	LA_2		
48	LCZ3	98	LA_3		
49	$LD\overline{Z3}$	99	LA_4		
50	LDZ3 ~~MATRIX~~ LET FLAGS	100	SLA		

TABLE 6. PHA EVENT FORMAT

Byte	Bit	Description
0-1	0	PN error outside BET 0 = none 1 = bit errors exceed PN
	1	Valid data flag 0 = valid 1 = no data
	2	GCF Block error 0 = no 1 = yes
	3	Spare
	4-15	TAG_1
2-3	0-3	0
	4-15	PHA_3 (For TET TAG_2)
4-5	0-3	0
	4-15	PHA_2
6-7	0-3	0
	4-15	PHA_1

LSELECT USER'S GUIDE

Through user input, LSELECT lists, dumps and/or copies MJS encyclopedia or work tape volumes, chapters, and verses between a given time range. LSELECT is a cross between the encyclopedia list program and the select verse program with the added capability of selecting time intervals.

The data cards must refer to volumes contained on the same input tape.

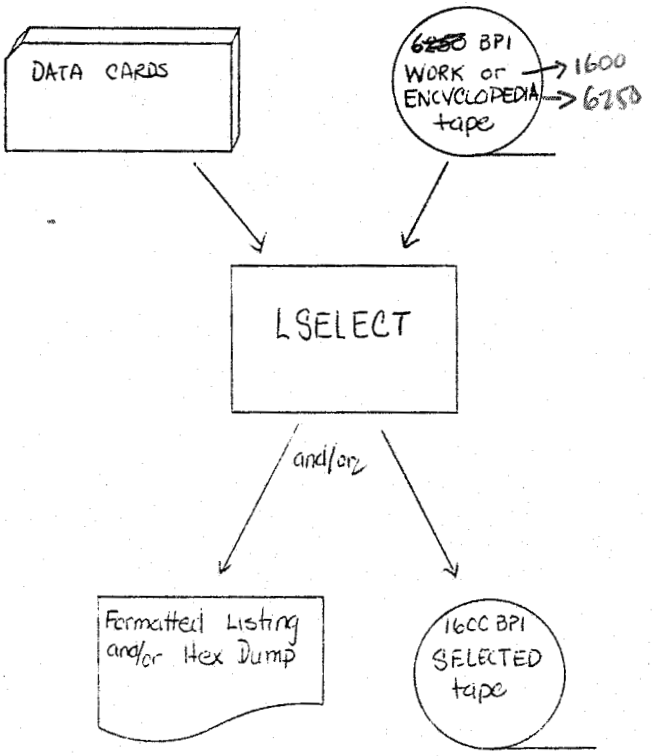


Figure 1 - System Flow Chart

The following is a list of the JCL Proc which is used to run a LSELECT job. Presently, the Proc resides in TSO library 'SBMJS.LSELECT.ASM(LSELECT)'.

```
//* SELECT VERSE PROCEDURE
//SELECT PROC SER=,        MASTER/WORK VOL-SER, 3 DIGITS VOL-SER
//            SOURCE=MASTER,  SOURCE ENCYCLOPEDIA. MASTER/WORK
//            STAPE=,       SELECT-VERSE TAPE VOLUME SERIAL NUMBER
//            SLABEL=SL,    SELECT-VERSE TAPE LABEL OPTION (SL/NL)
//            SATID=2,      SATELLITE ID: 2=VOYAGER-2,  1=VOYAGER-1
//            TYPE=UNKNOWN     USER ASSIGNED NAME (UPTO 8 CHARACTERS,
//*                            FIRST CHARACTER MUST BE ALPHABETIC)
//*                            THIS NAME IS PART OF DATASET NAME
//SELECT EXEC PGM=LSELECT,REGION=200K
//STEPLIB DD DSN=SBMJS.LSELECT.LOAD,DISP=SHR
//FT06F001 DD SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=1100)
//TAPEUNIT DD UNIT=(6250,,DEFER),DISP=(NEW,KEEP),DSN=DONTCARE,
//   VOL=SER=IDUNNO
//ENCY      DD DDNAME=&SOURCE
//WORK      DD DSN=V&SATID..WORK.ENCY,UNIT=AFF=TAPEUNIT,DISP=SHR,
//   VOL=SER=M&SATID.W&SER,DCB=(BUFNO=1)
//MASTER    DD DSN=V&SATID..MASTER.ENCY,UNIT=AFF=TAPEUNIT,DISP=SHR,
//   VOL=SER=M&SATID.E&SER,DCB=(BUFNO=1)
//FT20F001 DD DSN=V&SATID..&TYPE.,UNIT=(6250,,DEFER),DISP=(NEW,KEEP),
// VOL=SER=&STAPE,LABEL=(1,&SLABEL),DCB=(DEN=3,RECFM=U,BLKSIZE=20000)
//FT05F001 DD DDNAME=INPUT
//SELECT PEND
```

The following is a sample of a data card input.

```
//*FIRST     LAST HLC MASK4567890123456789012345 67
//INPUT DD *
   29431    29441 TTF FFTFTFFFFFFFTFFFFFFFFFFFFFFF
/*
```

The first (comment line) assists in the placement of the data input under //INPUT DD *.

FIRST	first volume to process
LAST	last volume to process
H	Hex-dump requested
L	List requested
C	Copy Tape requested
MASK(28)	'T' to note what verses are to be listed or copied (start with verse type 0)

The following is an example of a TSO STAB submit:

```
stab sel,t(h00h00)
=: jobcard
='sbmjs.lselect.asm(lselect)'
// exec select,ser=XXX,source=[master/work],stape=XXXXX,slabel=[sl/nl],
// satid=[2/1],type=[unknown/user name]
='zbeke.lselect.asm(input)'
// exec notifyts,userid=XXXXX
endinput
```

Notes:

(1) Time estimate varies.

(2) See proc listing for description of keyword parameters on EXEC SELECT card.

(3) 'ZBEKE.LSELECT.ASM(INPUT)' should be checked and edited, if necessary, before runs. Suggest that a user keep his own input file for the data card by copying this member.

To run from CRBE the user must have a copy of 'sbmjs.lselect.asm(lselect)' and 'zbeke.lselect.asm(input)' in his CRBE library.

```
/subm sel,h00h00
= jobcard
= select proc
// exec select,ser=XXX,source=master,stape=XXXXX;slabel=sl,
//        satid=2,type=lselect
= data input
// exec notify,usrid=XXXXX
endinput
```

Table of Contents

Distribution List 3
List of Charges 4

HET Description
1) Telescope Schematic 5
2) PHA, Discriminatior Values 6
3) Delta E vs E' Plots 7
4) Geometry Factors 8
5) Rates and Analysis 9

LET Description
1) Telescope Schematic 10
2) PHA, Discriminatior Values 11
3) Delta E vs E' Values 12
4) Geometry Factors 13
5) Rates and Analysis 14

TET Description
1) Telescope Schematic 15
2) PHA, Discriminator Values 16
3) Nominal Electron Response 17
4) Geometry Factors 18
5) Rates and Analysis 19

Electronics
1) Block Diagrams 20
2) Event Analysis 22
3) Rate System 25
4) Command/Status System 30
5) Calibration Stimulus System 32
6) Analog Multiplexer Data 33

Mechanical
1) Spacecraft Mechanical Configuration 34
2) Telescope Pointing Vectors 35

Caltech, M/C 220-47, Pasadena, CA 91125

WEA	Bill Althouse	2614
WRC	Rick Cook	2637
ACC	Alan Cummings	2708
TLG	Tom Garrard	2635
BWG	Brownlee Gauld	2638
CAG	Neil Gehrels	2637
RAM	Dick Mewaldt	2612
JDP	Jim Povlis	2605
ECS	Edward Stone	1516
RV	Rochus Vogt	1263

Goddard Space Flight Center, Greenbelt, MD 20771 301 982-XXX

		M/C	ext.
TC	Tom Conlon	663	6057
WDD	Bill Davis	661	6624
NL	Nand Lal	c/o 664	2824
FBMcD	Frank McDonald	660	4801
TvR	Tycho von Rosenvinge	661	6721
AWS	Al Schardt	663	5705
DES	Don Stilwell	663	6454
JHT	Jim Trainor	663	6282

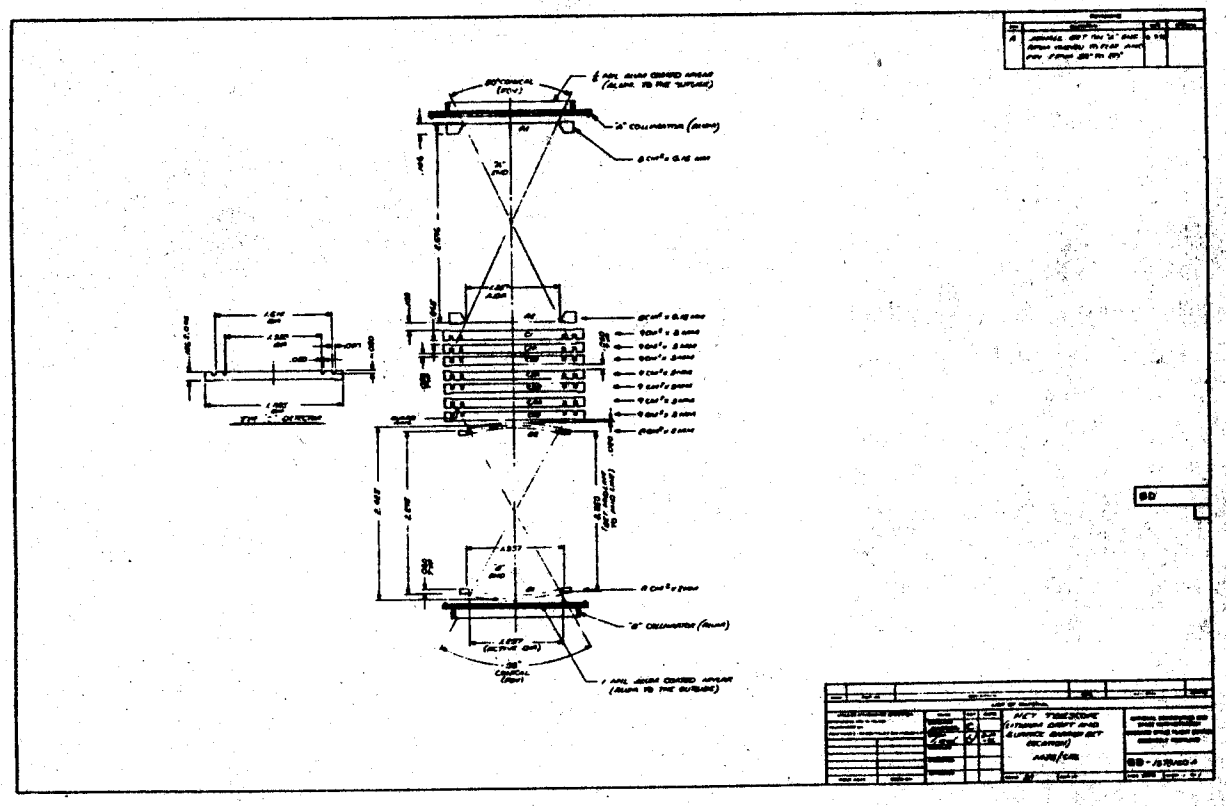
1/28/76 : So many changes since the 2/24/75 issue that I won't even try to list them. This entire document should be carefully studied.

2/25/76 : Changes and additions as discussed in the CRS team meeting of 16 and 17 Feb 1976.

8/25/76 : New HET config. Gain disc values are nominal design goals. Actual values will be listed when they are reported. HET guard logic modified. THI typo corrected on page 19. Block diagram added. Description of tag bits made more explicit. Typo corrected in equations for R5, R6, R7 on page 25. Cal stim modified.

4/01/77 : Swap SB, SB* in R5, R6, R7 on pages 9, 24, 27. Change L1, L2, L4 thresholds on page 11. G2* in HET tag word on page 23. Typo in LET SL* equation on page 24. Distinguish HG1 and HG2 on page 25. Correct missing D8* in R28 term on page 26. Add page 28,29. Modify analog mux list on page 33.

8/07/78 : New distr. list. Slant SB fixed (p6). Geometry factors added (p8). Typo corrected (p9). Dimensions added to LET schematic (p10). Remove discr. data (p11). LET geometry factors added (p13).
Dimensions added to TET schematic (p15). Remove discrim. data (p16).
New Nominal Electron Response graph (p17). Correct THI simplified logic equ. (p19). Add lines to table (p23). Correct TET analysis equ. (p24).
Correct typos (p31). Change register designations (p32). Change detector #'s (p32). Add LET&TET pointing vectors (p35).



Approved _____ Date _____

design goals :

Detector	High Gain thresh (MeV)	High Gain full scale (MeV)	High Gain channel width (keV)	Low Gain thresh (MeV)	Low Gain full scale (GeV)	Low Gain channel width (MeV)	gain change factor
A1,A2	0.1	188	46	0.5	0.94	0.23	5.
B1	0.3	730	178	1.02	2.50	0.61	3.42
B2	0.3	730	178	2.04	5.00	1.22	6.84
C1	0.5	1024	250	2.5	5.12	1.25	5.
C2, C3, C4	0.92	XX	XX	4.6	XX	XX	5.
C1 + C2 + C3	XX	3523	860	XX	17.61	4.30	5.
C2 + C3 + C4	XX	3523	860	XX	17.61	4.30	5.
G1	0.3	XX	XX	0.3	XX	XX	XX
G2	2.5	XX	XX	2.5	XX	XX	XX
G3	9.	XX	XX	9.	XX	XX	XX

Slants

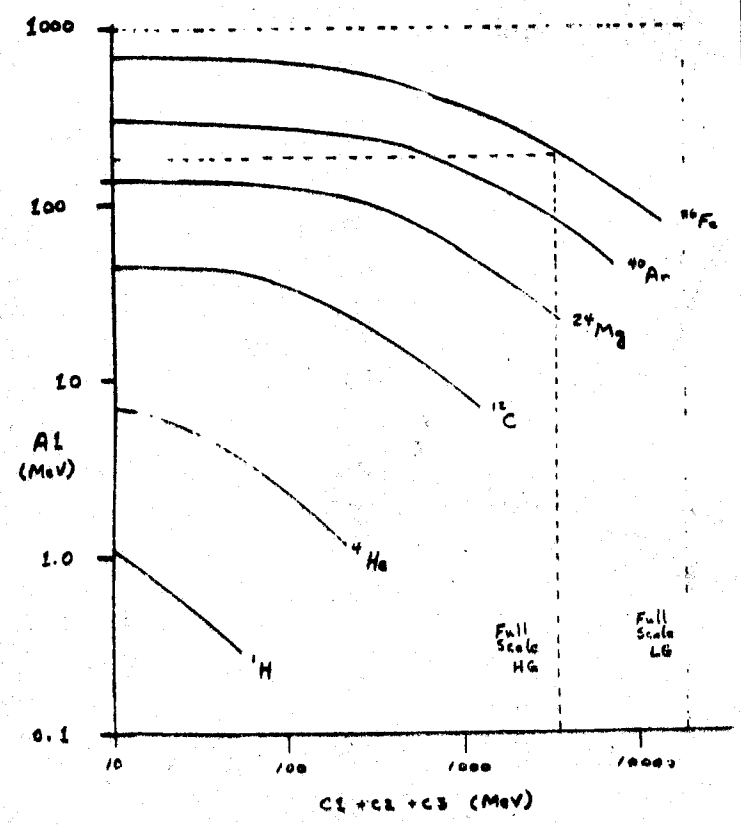
SB : B1 + B2 + (2 + 3 + 4) = 60 (channels)
Low Gain B1 + 0.5B2 + 0.142(C2 + C3 + C4) = 36.6 (Mev)
High Gain B1 + B2 + 0.207(C2 + C3 + C4) = 10.7 (MeV)

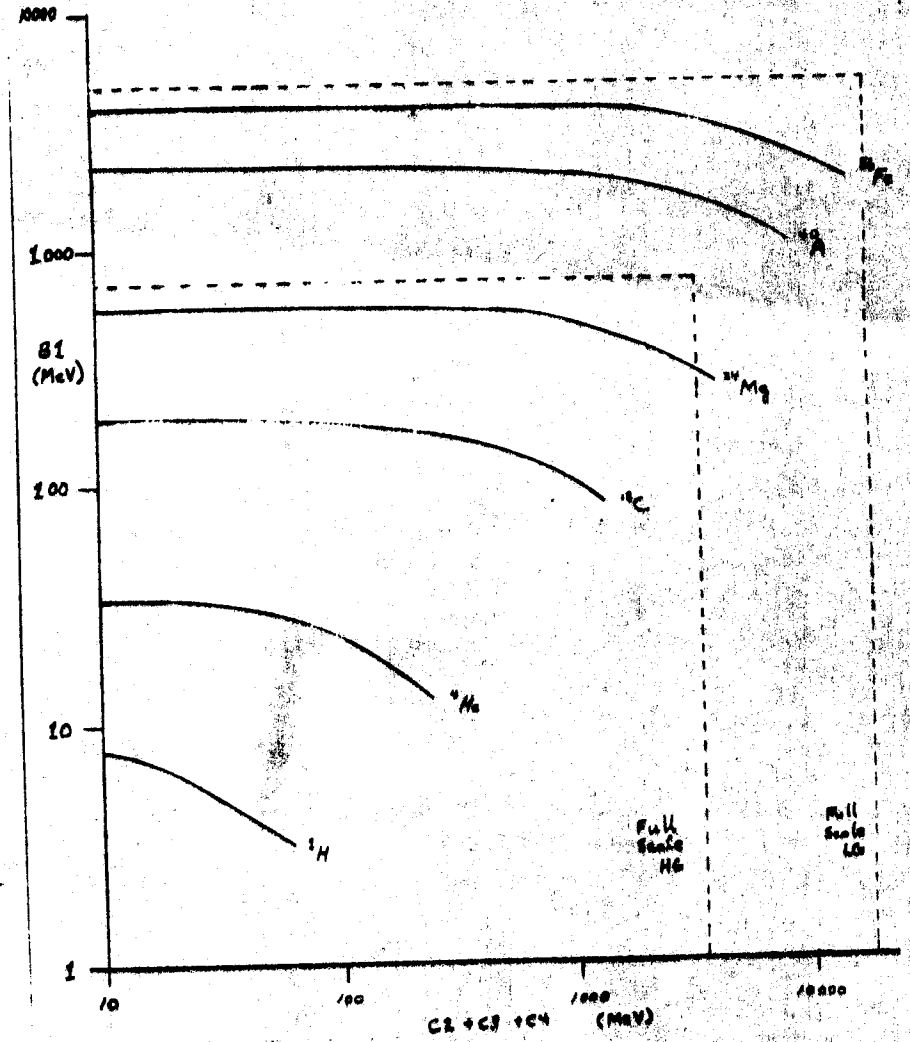
SA : Low Gain only SA2 : A1 + 0.60A2 + 0.29(C1 + C2 + C3) = 24 (MeV)
SA1 : A1 + 0.60A2 + 0.02(C1 + C2 + C3) = 9 (MeV)
SA = SA1.SA2

Full Scale = 10V in preamp, 5v in ADC; coupling done with 2:1 transformer.
G1, G2, G3: 10V preamp output for 396 MeV, not gain switched.
C2, C3, C4: 10V preamp output for 1.86 GeV in high gain, 9.63 GeV in low gain.

Approved _____ Date _____

MJS CRS SRD
HET 3) Delta E vs E' Plots





Approved _____ Date _____

Event Type	Range	Geometry Factor (cm**2.sr)
AS	A2	1.235
AS	C3	0.851
BS	B2	1.691
BS	C2	0.960
PEN		1.650

Approved _____ Date _____

HET 1 is described; HET 2 is similar.

Name	Accum Number	Gain (S5)	Subcom State (S1 - S4)	Simplified Logic Equation	Description
AS	R1	HG	all	A1.A2.C4*.G1*	All nuclei of appropriate range, 0.15 to 15.3 mm Si nominal. Electrons eliminated by thin A detectors.
ASZ3	R1	LG	all	A1.A2.SA.C4*.G3*	All nuclei of Z>=3 of appropriate range, 0.15 to 15.3 mm Si nominal. Z<3 eliminated by slant, SA.
BSZ2	R2	LG	all	B1.B2.SB.C1*.G3*	All nuclei of Z>=2 of appropriate range, 2 to 22 mm Si nominal. Electrons, Z=1 eliminated by slant, SB.
BSp	R2	HG	S1=0 or S2=0(3/4)	B1.B2.SB.C1*.G1*	All nuclei of appropriate range, 2 to 22 mm Si nominal.
BSe	R2	HG	S1=S2=1 (1/4)	B1.B2.C4.SB*.C1*.G1*	Electrons of appropriate range, 4 to 22 mm Si nominal. Nuclei eliminated by slants.
PEN	R3	both	all	B1.B2.C1	All particles of range greater than 22 mm Si nominal.
PG	R4	both	all	PEN.G1*	Same as PEN, but some heavies lost due to knock-ons and cross-talk in guards.
BS4Z2*	R5	LG	odd (S1=1)	B1:B2.C4.C3*.SB*.G1*	Protons of appropriate range, 4 to 10 mm. Z>=2 eliminated by slant. Most electrons eliminated by high thresholds on B1 and B2.
BS4Z2	R5	LG	even (S1=0)	B1.B2.C4.C3*.SB.G1*	Z>=2 of appropriate range, 4 to 10 mm.
BS4e	R5	HG	odd	B1.B2.C4.C3*.SB*.G1*	Electrons of 4 to 10 mm. Nuclei eliminated by slant.
BS4p	R5	HG	even	B1.B2.C4.C3*.SB.G1*	Nuclei of 4 to 10 mm. Electrons eliminated by slant.
BS3Z2*	R6	as above		- - C4.C3.C2* - -	As above, except nominal range of 10 to 16 mm Si.
BS3Z2					
BS3e					
BS3p					
BS2Z2*	R7	as above		- - C4.C3.C2.C1* - -	As above, except nominal range of 16 to 22 mm Si.
BS2Z2					
BS2e					
BS2p					

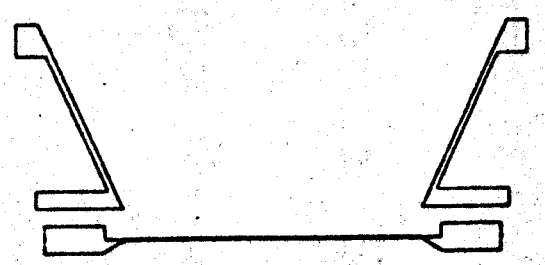
Analysis is tied to rates R1, R2, and R3. Buffers are called HET AS, HET BS, and HET P.
Following table shows name of analysis requirement as function of gain, subcom state, and buffer.

Gain	Buffer Subcom State	HET AS	HET BS	HET P
LG	all	ASZ3	BSZ2	PEN
HG	S1=0 or S2=0	AS	BSp	PEN
HG	S1=S2=1	AS	BSe	PEN

Approved _____ Date _____

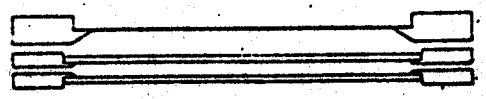
1) Telescope Schematic

	Radius (cm)	Thickness (um)
Al Window		3
L1	0.095	35



4.07 cm

L2	0.095	35
L3	1.13	450
L4	1.13	450



.21 cm

.31 cm

Approved _____ Date _____

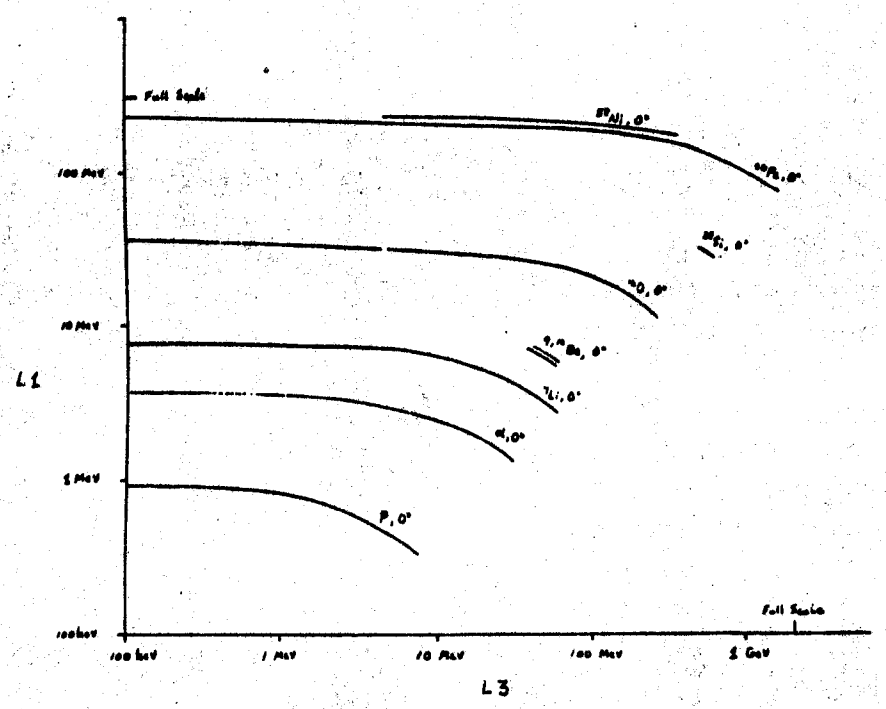
MJS CRS SRD
LET 2) PHA, Discriminator Values

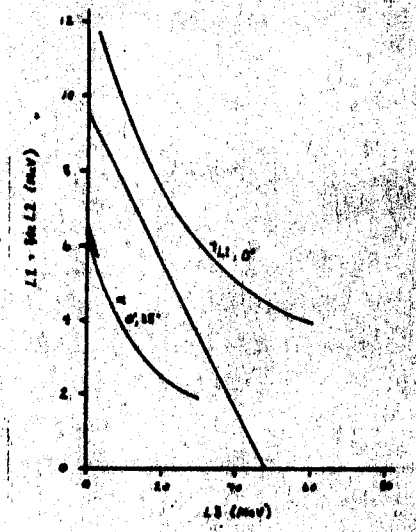
Detector	Threshold (MeV)	Full Scale (MeV)	Channel Width (keV)
L1, L2	0.2	307	75
L3	1.00	2048	500
L4	0.3	XX	XX

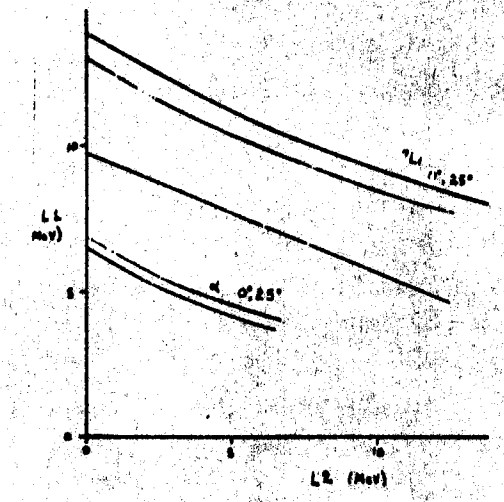
Slant
SL : L1 + 0.42L2 + 0.20L3 + 9.6 (MeV)

L4: 10V preamp output for 25 MeV.
2:1 transformer is on output of L4 preamp.

Approved _____ Date _____







Approved _____ Date _____

	L1 Active Area* (0.0037 cm)	L2 Active Area* (0.0037 cm)	L1-L2 Separation (0.005 cm)	A ** (0.0012 cm -sr)
FU-1				
LET A	2.8384	2.8259	4.076	0.4366
LET B	2.8228	2.8466	4.081	0.4364
LET C	2.8273	2.8222	4.079	0.4338
LET D	2.8112	2.8152	4.075	0.4312
FU-2				
LET A	2.8180	2.8299	4.075	0.4344
LET B	2.8064	2.8251	4.064	0.4341
LET C	2.8364	2.7900	4.084	0.4295
LET D	2.8344	2.8039	4.061	0.4357

* Area relative to the optical area of 15-158C (2.82939 cm); fourth place accuracy is only relative.
** L1xL2 required; fourth place accuracy is only relative.

Approved _____ Date _____

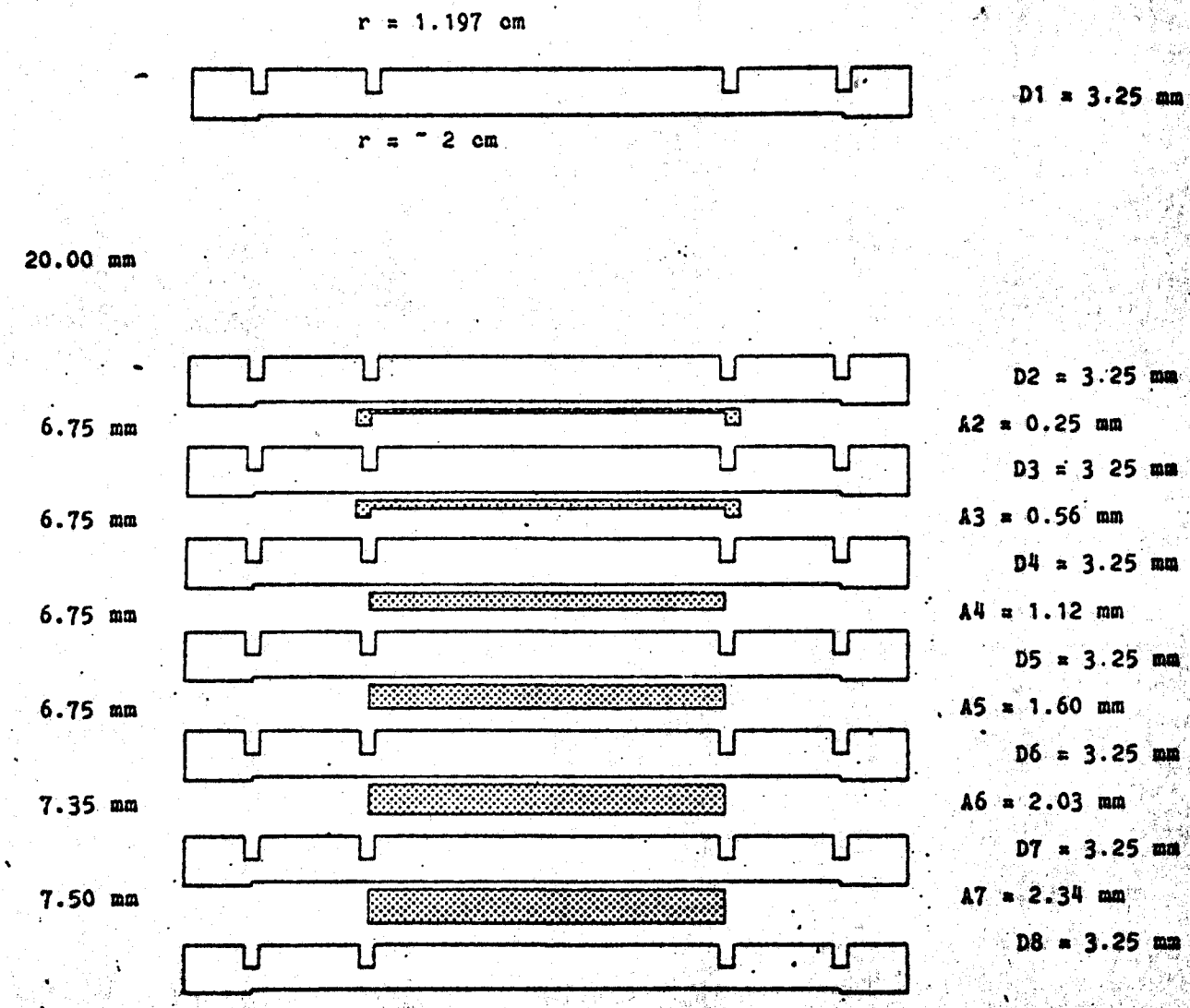
LET A is described; LET's B, C, and D are similar.

Name	Accum Number	Subcom State (S1-S4)	Simplified Logic Equation	Description
LAZ3*	R17	all	L1.L2.L3.SL*.L4*	Z<3 of appropriate range, 70 to 520 microns Si nominal.
LAZ3	R18	all	L1.L2.L3.SL.L4*	Z>=3 of appropriate range, 70 to 520 microns Si nominal.
LATRP	R25	6 & 14	L1.L2.L3.L4*	Nuclei of appropriate range, 70 to 520 microns Si nominal.

LAZ3* causes analysis and events are stored in buffer LET SL*.
LAZ3 causes analysis and events are stored in buffer LET SL.

Note that R17 and R18 are subject to modification by the command system; R25 is not.

Approved _____ Date _____



Approved _____ Date _____

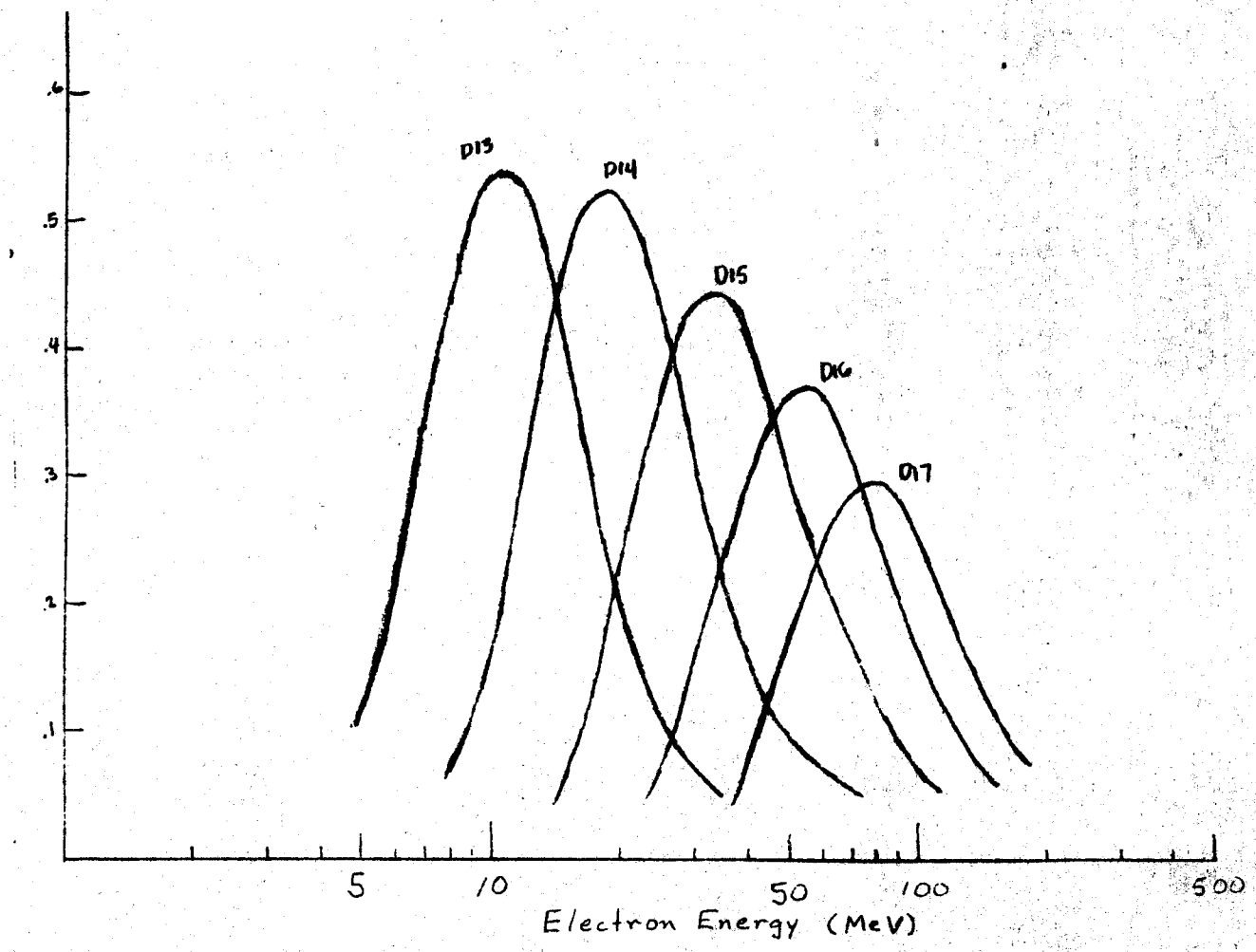
2) PHA, Discriminator Values

Detector	Threshold Lower (MeV)	Threshold Upper (MeV)	Full Scale (MeV)	Channel Width (keV)
D1, D2	0.5	2.5	2.5	19.4
D3 to D7	0.5	8.0	XX	XX
D8	0.2	XX	XX	XX
GA, GB	0.2	XX	XX	XX

Preamp full scale 10V = 24.70 MeV
2.47 MeV = channel 127 of ADC.

Approved _____ Date _____

3) Nominal Electron Response



Approved _____ Date _____

Nominal geometry factors for the various ranges are given by the formula:

Geometry Factor = 0.5*PI**2[L**2 + 2*r**2 - L*SQRT(L**2 + 4*r**2)]
where r = 1.20 cm.

Range	L (cm)	Geometry Factor (cm**2-sr)
D12	2.00	3.12
D13	2.63	2.14
D14	3.26	1.53
D15	3.90	1.14
D16	4.58	0.86
D17	5.30	0.66

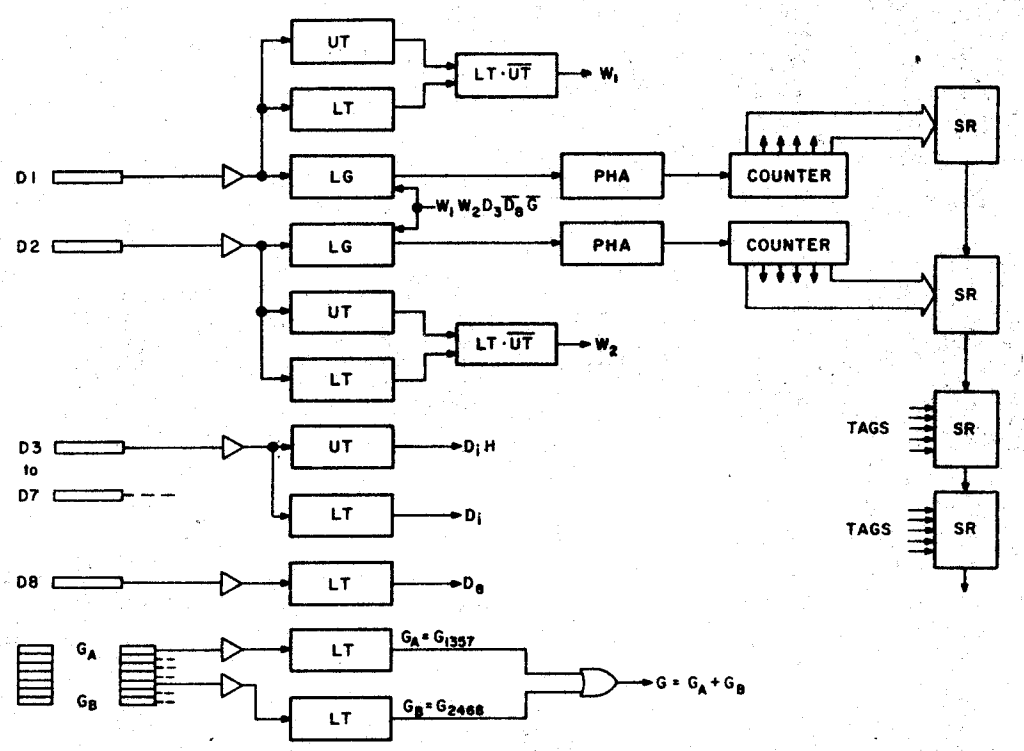
Approved _____ Date _____

Name	Accum Number	Subcom State (S1-S4)	Simplified Logic Equation	Description
TAN	R28	all	W1.W2.D3.D8*.G*	Electrons of appropriate range. See nominal response curves.
TLO	R29	even (S1=0)	TAN.D5.D6*.UT*	Low energy electrons.
THI	R29	odd (S1=1)	TAN.D6.D7.UT*	High energy electrons.

TAN causes analysis. Events are stored in buffer called TET.

UT= upper threshold.

Approved _____ Date _____

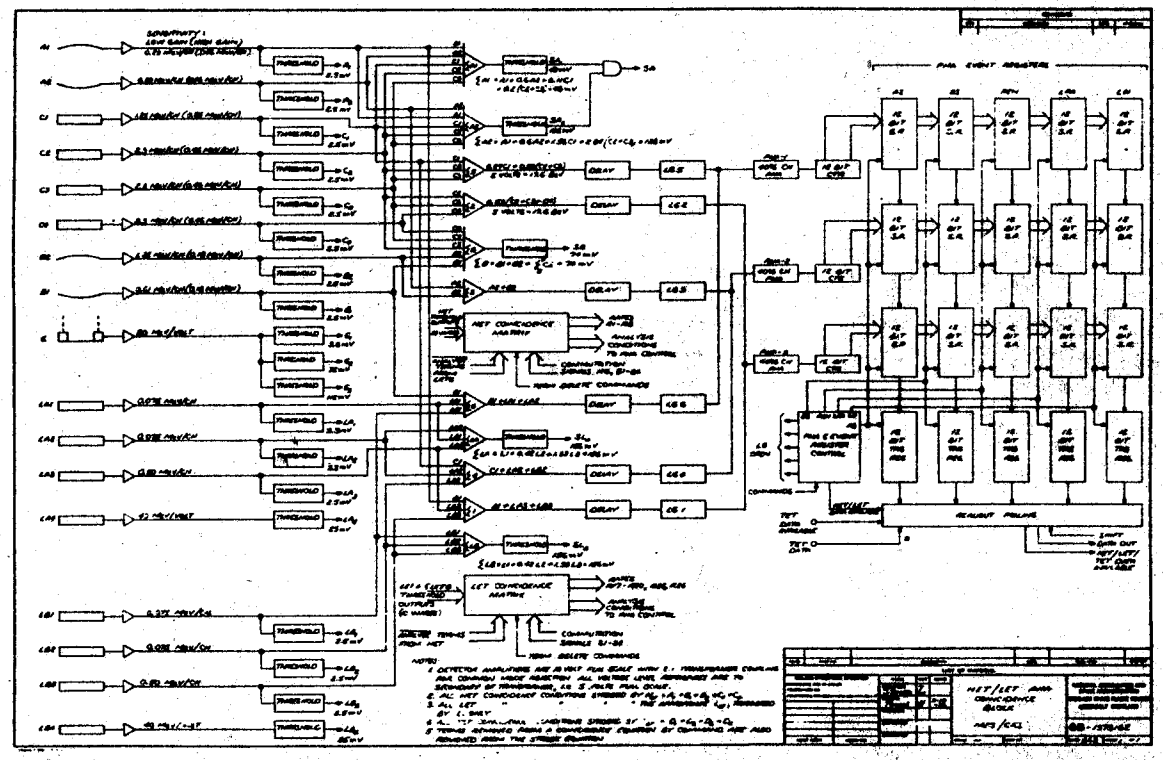


UT = UPPER THRESHOLD
LT = LOWER THRESHOLD

TET BLOCK DIAGRAM

Approved _____ Date _____

1) Block Diagrams



Rate commutator and cal stim block diagram available from DS or TG.
Need Data System Block Diagram.

Approved _____ Date _____

3 parallel redundant systems :

Block I :
- HET 1
- LET A
- LET B
- Rates 1 to 8, 17 to 20, 25
- Event Buffers for HET AS, HET BS, HET P, LET SL, LET SL*

Block II :
- HET 2
- LET C
- LET D
- Rates 9 to 16, 21 to 24, 26
- Event Buffers for HET AS, HET BS, HET P, LET SL, LET SL*

TET :
- TET
- Rates 28 to 30
- Event Buffer for TET

Blocks I and II are fully symmetrical. LET's A/B and C/D are fully symmetrical.

PHA Readout :

LET and HET

Sum	AS	BS	P	LET
A1 + LA3 + LB3	PHA3			PHA3
C2 + C3 + C4		PHA3	PHA3	
A2 + B2	PHA2	PHA2		
C1 + LA2 + LB2			PHA2	PHA2
C1 + C2 + C3	PHA1			
B1 + LA1 + LB1		PHA1	PHA1	PHA1

TET

D1	PHA1
D2	PHA2

Gain switching in HET is done with S5 after each 480 rate readouts when in AUTO mode.
High gain for S5 = 1

Approved _____ Date _____

Tag Bits :	1	2	3	4	5	6	7	8	9	10	11	12
HET AS	C1	C2	C3	C4	slant	G2*	G1.G3*	HG	0	0	block	caution
HET BS,PEN	C1	C2	C3	C4	slant	G2*	G1.G3*	HG	0	1	block	caution
LET A/B	slant	L3	L2	LB1	DLA2	DLB3	DLB2	DLA3	1	0	block=0	caution
LET C/D	slant	L3	L2	LD1	DLC2	DLD3	DLD2	DLC3	1	0	block=1	caution
TET (1)	D1L	D1H	D2L	D2H	D3L	D3H	D4L	D4H	1	1	0	caution
TET (2)	GA	GB	SD7/8	AD4L	D5L	D5H	D6L	D6H	D7L	D7H	D8L	GA + GB

Block = 0 for block I, 1 for Block II.

Caution flag = overflow in PHA or high gain/low gain switching in progress.

Polling:
Each event type is stored in a separate 48-bit register dedicated to that event type. Each block has 5 registers. The TET system has one register which may be sampled by either block. Between readouts, each block scans the event registers in the sequence LET SL*, LET SL, HET AS, HET BS, LET SL*, LET SL, HET PEN, TET, stopping only at a full register. A separate two-level polling device toggles alternately between blocks if both have data available, or selects data from the appropriate block if only one has data. If both blocks are empty, a null event is readout (48 0's).

Word format:

	1 12	13 24	25 36	37 48
HET/LET	TAG WORD	PHA3	PHA2	PHA1
TET	TAG WORD 1	TAG WORD 2	PHA2	PHA1

Approved _____ Date _____

Block I Analysis Equations

```
HET AS :        R1.LA3*.LB3*.SAS*.NAA*.BPHA*
  low gain      A1.[A2].[C4*].[G3*].SA.[B2*].LA3*.LB3*.SAS*.NAA*.BPHA*
  high gain     A1.[A2].[C4*].[G1*].G2*.[B2*].LA3*.LB3*.SAS*.NAA*.BPHA*

HET BS :        R2.LA1*.LB1*.SABp*.SABe*.NAB*.BPHA*
  low gain      [B1].[B2].[C1*].[G3*].SB2.[A2*].LA1*.LB1*.NAB*.BPHA*
  high gain     [B1].[B2].[C1*].[G1*].G2*.SB1.[A2*].LA1*.LB1*.NAB*.BPHA*    if S1.S2 = 0
  high gain     [B1].[B2].[C1*].[C4].[G1*].G2*.SB1*.[A2*].LA1*.LB1*.NAB*.BPHA*   if S1.S2 = 1

HET PEN   :     R3.LA1*.LA3*.LB1*.LB3*.SAP*.NAP*.BPHA*
                [B1].[B2].[C1].LA1*.LA2*.LB1*.LB2*.SAP*.NAP*.BPHA*

LET SL* :       R17.SALA*.NALI*.BHET1*.BLETB.BPHA* + R19.SALB*.NALI*.BHET1*.BLETA*.BPHA*
                LA1.[LA2].[LA3].LA4*.SLA*.NALI*.BHET1*.BLETB*.BPHA*
                   + LB1.[LB2].[LB3].LB4*.SLB*.SALB*.NALI*.BHET1*.BLETA*.BPHA*

LET SL :        R18.SALA*.NALII*.BHET1*.BLETB*.BPHA* + R20.SALB*.NALII*.BHET1*.BLETA*.BPHA*
                LA1.[LA2].[LA3].LA4*.SLA.LSLA*.NALII*.BHET1*.BLETB*.BPHA*
                   + LB1.[LB2].[LB3].LB4*.SLB.SALB*.NALII*.BHET1*.BLETA*.BPHA*
```

TET analysis Equations

```
TET             R28.BTET*.SAT*.NAT*
                [D1L].[D1H*].[D2L].[D2H*].[D3L].(D4L + AD4L*).(D7L* + SD7/8*).(D8L* + SD7/8)
                   .[GA*].[GB*].BTET*.SAT*.NAT*.TST
```

Definitions:

Command bits
SAS = Suppress AS mode
SABp = Suppress BSp mode
SABe = Suppress BSe mode
SAP = Suppress PEN mode
SALA = Suppress LET A
SALB = Suppress LET B
SAT = Suppress TET

Strobe signals
HST1 = HET 1 strobe = A1 + [B1] + [B2] + [C1] + [C4]
LSTA = LET A strobe = L1
LSTB = LET B strobe = LB1
TST = TET strobe = [D1L] + [D2L] + [D3L] + (D4L.AD4L)

Busy flags
BHET1 = A1 + B1 + C1
BLETA = LA1 + LA2 + LA3
BLETB = LB1 + LB2 + LB3
BPHA = busy PHA
NAA = AS register full
NAB = BS register full
NAT = TET register full
NALI = LET SL* register full
NALII = LET SL register full
BTET = TET PHA busy

Approved _____ Date _____

Rate definitions

```
R1 = ASZ3.HG1* + AS.HG1
   = A1.[A2].(SA + HG1).[C4*].([G1*].G2* + HG1*).([G3*] + HG1).[B2*].HST1
ASZ3 = A1.[A2].SA.[C4*].[G3*].[B2*].HST1
AS   = A1.[A2].[C4*].[G1*].G2*.[B2*].HST1

R2 = BSZ2.HG1* + BSp.(S1* + S2*).HG1 + BSe.(S1.S2).HG1
   = [B1].[B2].[C1*].([C4] + HG1* + S1* +S2*).(SB1 + HG1* + S1.S2).(SB1* + HG1* + S1* + S2*)
     .(SB2 + HG1).([G1*].G2* + HG1*).([G3*] + HG1).[A2*].HST1
BSZ2 = [B1].[B2].[C1*].SB2.[G3*].[A2*].HST1
BSp  = [B1].[B2].[C1*].SB1.[G1*].G2*.[A2*].HST1
BSe  = [B1].[B2].[C1*].[C4].SB1*.[G1*].G2*.[A2*].HST1

R3 = PEN = [B1].[B2].[C1].HST1

R4 = PEN.G1*

R5 = BS4Z2*.HG1*.S1 + BS4Z2.HG1*.S1* + BS4e.HG1.S1 + BS4p.HG1.S1*
   = [B1].[B2].C3*.[C4].G1*.(SB1* + HG1* + S1).(SB1 + HG1* + S1*).(SB2* + HG1 + S1).(SB2 + HG1 + S1*).HST1
BS4Z2* = [B1].[B2].C3*.[C4].G1*.SB2*
BS4Z2  = [B1].[B2].C3*.[C4].G1*.SB2
BS4e   = [B1].[B2].C3*.[C4].G1*.SB1*
BS4p   = [B1].[B2].C3*.[C4].G1*.SB1

R6 = BS3Z2*.HG1*.S1 + BS3Z2.HG1*.S1* + BS3e.HG1.S1 + BS3p.HG1.S1*
   = [B1].[B2].C2*.C3.[C4].G1*.(SB1* + HG1* + S1).(SB1 + HG1* + S1*).(SB2* + HG1 + S1).(SB2 + HG1 + S1*).HST1
BS3Z2* = [B1].[B2].C2*.C3.[C4].G1*.SB2*.HST1
BS3Z2  = [B1].[B2].C2*.C3.[C4].G1*.SB2.HST1
BS3e   = [B1].[B2].C2*.C3.[C4].G1*.SB1*.HST1
BS3p   = [B1].[B2].C2*.C3.[C4].G1*.SB1.HST1

R7 = BS2Z2*.HG1*.S1 + BS2Z2.HG1*.S1* + BS2e.HG1.S1 + BS2p.HG1.S1*
   = [B1].[B2].C2.C3.[C4].G1*.(SB1* + HG1* + S1).(SB1 + HG1* + S1*).(SB2* + HG1 + S1).(SB2 + HG1 + S1*).HST1
BS2Z2* = [B1].[B2].C2.C3.[C4].G1*.SB2*.HST1
BS2Z2  = [B1].[B2].C2.C3.[C4].G1*.SB2.HST1
BS2e   = [B1].[B2].C2.C3.[C4].G1*.SB1*.HST1
BS2p   = [B1].[B2].C2.C3.[C4].G1*.SB1.HST1
```

Where HG1 = high gain bit for HET 1, and other definitions are on the preceding page.

Approved _____ Date _____

Rate definitions

R8 = singles, as listed in the rate table.

R17 = LA1.[LA2].[LA3].LA4*.SLA*.LSTA

R18 = LA1.[LA2].[LA3].LA4*.SLA.LSTA

R19 = LB1.[LB2].[LB3].LB4*.SLB*.LSTB

R20 = LB1.[LB2].[LB3].LB4*.SLB.LSTB

R25 = Singles, etc. as listed in the rate.
LATRP = LA1.LA2.LA3.LA4*.LSTA
LBTRP = LB1.LB2.LB3.LB4*.LSTB

R27 is spare accumulator.

R28 = [D1L].[D1H*].[D2L].[D2H*].[D3L].(D4L + AD4L*).(D7L* + SD7/8*).(D8* + SD7/8).[GA*].[GB*].TST
= TAN

R29 = TLO.S1* + THI.S1
= [D1L].[D1H*].[D2L].[D2H*].[D3L].[D3H*].(D4L + AD4L*).D4H*.(D5L + S1).D5H*.(D6L* + S1).D6H*
.(D7L + S1* + SD7/8).(D7L* + S1* + SD7/8*).D7H*.(D8L* + S1*).[GA*].[GB*].TST
TLO = [D1L].[D1H*].[D2L].[D2H*].[D3L].[D3H*].(D4L + AD4L*)D4H*.D5L.D5H*.D6L*D6H*.D7H*.[GA*].[GB*].TST
THI = [D1L].[D1H*].[D2L].[D2H*].[D3L].[D3H*].(D4L + AD4L*).D4H*.D5H*.D6L.D6H*.(D7L + SD7/8).(D7L* + SD7/8*)
.D7H*.D8L*.[GA*].[GB*].TST

R30 = Singles, as listed in the rate table.

Approved _____ Date _____

Rate table

SB	R1	R2	R3	R4	R5	R6	R7	R8	R17	R18	R19	R20	R25	R28	R29	R30
0	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	A1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA1	TAN	TLO	D6L
1	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	A2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA2	TAN	THI	GA + GB
2	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	C1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA3	TAN	TLO	D5H
3	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	C2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA4	TAN	THI	D7L
4	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D6H
5	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D7H
6	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D5L
7	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D8L
8	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	C3	LAZ3*	LAZ3	LBZ3*	LBZ3	LB1	TAN	TLO	D1H
9	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	C4	LAZ3*	LAZ3	LBZ3*	LBZ3	LB2	TAN	THI	D4H
10	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	B2	LAZ3*	LAZ3	LBZ3*	LBZ3	LB3	TAN	TLO	D2L
11	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	G1	LAZ3*	LAZ3	LBZ3*	LBZ3	LB4	TAN	THI	D3L
12	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D1L
13	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D3H
14	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D2H
15	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D4L
16	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	A1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA1	TAN	TLO	D6L
17	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	A2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA2	TAN	THI	GA + GB
18	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	C1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA3	TAN	TLO	D5H
19	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	C2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA4	TAN	THI	D7L
20	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D6H
21	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D7H
22	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D5L
23	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D8L
24	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	C3	LAZ3*	LAZ3	LBZ3*	LBZ3	LB1	TAN	TLO	D1H
25	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	C4	LAZ3*	LAZ3	LBZ3*	LBZ3	LB2	TAN	THI	D4H
26	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	B2	LAZ3*	LAZ3	LBZ3*	LBZ3	LB3	TAN	TLO	D2L
27	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	G1	LAZ3*	LAZ3	LBZ3*	LBZ3	LB4	TAN	THI	D3L
28	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D1L
29	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D3H
30	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D2H
31	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D4L

SB = Subcom state = S1 + 2.S2 + 4.S3 +8.S4 + 16.S5 S5 = HG
Rate table is for AUTO mode. When CRS is commanded to HG or HG* mode only the bottom or top half is read out.
Note that there are actually two high gain bits.

Approved _____ Date _____

subcom state	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
rate accum																
1	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS
2	BSp	BSp	BSp	BSe	BSp	BSp	BSp	BSe	BSp	BSp	BSp	BSe	BSp	BSp	BSp	BSe
3	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN
4	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG
5	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e
6	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e
7	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e
8	A1	A2	C1	C2	B1	SA1	SA2	SB	C3	C4	B2	G1	B1	SA1	SA2	SB
9	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS
10	BSp	BSp	BSp	BSe	BSp	BSp	BSp	BSe	BSp	BSp	BSp	BSe	BSp	BSp	BSp	BSe
11	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN
12	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG
13	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e	BS4p	BS4e
14	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e	BS3p	BS3e
15	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e	BS2p	BS2e
16	A1	A2	C1	C2	B1	SA1	SA2	SB	C3	C4	B2	G1	B1	SA1	SA2	SB
17	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*
18	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3
19	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*
20	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3
21	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*
22	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3
23	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*
24	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3
25	LA1	LA2	LA3	LA4	LASL	LBSL	LATRP	LBTRP	LB1	LB2	LB3	LB4	LASL	LBSL	LATRP	LBTRP
26	LC1	LC2	LC3	LC4	LCSL	LDSL	LCTRP	LDTRP	LD1	LD2	LD3	LD4	LCSL	LDSL	LCTRP	LDTRP
27																
28	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN
29	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI
30	D6L	GA+GB	D5H	D7L	D6H	D7H	D5L	D8L	D1H	D4H	D2L	D3L	D1L	D3H	D2H	D4L

Approved _____ Date _____

subcom state	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
rate accum																
1	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3
2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2	BSZ2
3	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN
4	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG
5	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*
6	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*
7	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*
8	A1	A2	C1	C2	B1	SA1	SA2	SB	C3	C4	B2	G1	B1	SA1	SA2	SB
9	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3	ASZ3
10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10	BSZ10
11	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN
12	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG
13	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*	BS4Z2	BS4Z2*
14	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*	BS3Z2	BS3Z2*
15	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*	BS2Z2	BS2Z2*
16	A1	A2	C1	C2	B1	SA1	SA2	SB	C3	C4	B2	G1	B1	SA1	SA2	SB
17	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*	LAZ3*
18	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3	LAZ3
19	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*	LBZ3*
20	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3	LBZ3
21	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*	LCZ3*
22	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3	LCZ3
23	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*	LDZ3*
24	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3	LDZ3
25	LA1	LA2	LA3	LA4	LASL	LBSL	LATRP	LBTRP	LB1	LB2	LB3	LB4	LASL	LBSL	LATRP	LBTRP
26	LC1	LC2	LC3	LC4	LCSL	LDSL	LCTRP	LDTRP	LD1	LD2	LD3	LD4	LCSL	LDSL	LCTRP	LDTRP
27																
28	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN	TAN
29	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI	TLO	THI
30	D6L	GA+GB	D5H	D7L	D6H	D7H	D5L	D8L	D1H	D4H	D2L	D3L	D1L	D3H	D2H	D4L

Approved _____ Date _____

4) Command/Status System

Each 12-bit serial command consists of a 4-bit address code specifying a subsystem or device to be controlled, and 8 command data bits. Bit number 1 is the first bit transmitted, and is the MSB of the address code.

bit :	1	2	3	4	5	6	7	8	9	10	12
	address				data						

Address	Use in command and/or status
0	Status readout of some miscellaneous control bits
1	HET 1 preamps
2	HET 2 preamps
3	LET A/B preamps
4	LET C/D preamps
5	Block I PHA control
6	Block II PHA control
7	Block I analysis control
8	Block II analysis control
9	unused
10	TET control
11	TET preamps
12	HET C preamps
13	Miscellaneous control
14	unused
15	unused

Status readout pattern duplicates commands exactly except for addresses 0 and 10. Address 0 is for status readout only. Address 10 has different bit order for command and status. See command/status table.

Approved _____ Date _____

Command/status table

1 2 3 4	3-6 0	7-10 11-14 1&2	15-18 19-22 3&4	23-26 27-30 5&6 LA/LC	31-34 35-38 7&8 LB/LD	cmnd 10	39- stat 10	11	12	13	14	15
5	redundant polling	A1 power off	LA1 power off	Delete LA3 terms	Delete LB3 terms	Disable TET	Add D4 terms	D1 power off	H1C1 power off	High Volt enable		
6		A2 power off	LA2 power off	Delete LA2 terms	Delete LB2 terms	Delete W1 terms	Disable TET	D2 power off	H1C2 power off	Cal Stim disable		
7	High Volt enable	B1 power off	LA3 power off	Disable H1P mode	Delete G* terms	Delete D3 terms	Delete GB* terms	D3 power off	H1C3 power off	redundant polling		
8	HET 2 high gain	B2 power off	LA4 power off	Disable H1BSp mode	Delete C4 terms	Subs D7L* for D8*	Delete GA* terms	D4 power off	H1C4 power off			
9	HET 1 high gain	C1 Guard power off	LB1 power off	Disable H1BSe mode	Delete C1 terms	Delete W2 terms	Subs D7L* for D8*	D5 power off	H2C1 power off	H1 Gain auto		
10	Cal Stats Q3 (MSB)	C2 Guard power off	LB2 power off	Disable H1AS mode	Delete B2 terms	Delete GB* terms	Delete D3 terms	D6 power off	H2C2 power off	H1 Gain set high		
11	Cal Stats Q2	C3 Guard power off	LB3 power off	Disable LET B	Delete B1 terms	Delete GA* terms	Delete W1 terms	D7 power off	H2C3 power off	H2 Gain auto		
12	Cal Stats Q1 (LSB)	C4 Guard power off	LB4 power off	Disable LET A	Delete A2 terms	Add D4 terms	Delete W2 terms	D8 power off	H2C4 power off	H2 Gain set high		

TET

HET-I	HET-II
LET-A	LET-C
LET-B	LET-D

Approved _____ Date _____

5) Calibration Stimulus System

The cal sequence begins at the start of the first complete rate commutator cycle following receipt of the cal command. The sequence lasts for 6 complete commutator cycles (i.e. 8 x 16 x 30 = 3840 rate words, about 12.5 minutes at normal data rates) and turns off automatically. Data will not appear in telemetry until completion of the first accumulation interval within the commutator cycle (delay is 8 second minimum, 104 second maximum). HET, LET, and TET test pulses do not occur simultaneously but are separated by about 70 microseconds. Each occurs at a repetition rate of 3.6 kHz. There are a total of 10 separate cal busses which are pulsed separately and in combination, as shown in the table below. Coincidence rates stimulated are also listed; not shown are the appropriate singles in R8, R16, R25, R26, and R30. The rates which are not stimulated by this cal sequence are R7, R15, R17, R19, R21, and R23. Of these the last four (LET's without slants) can be stimulated by turning off the L3 preamps and disabling the L3 terms in the coincidence system.

cal busses on during cal period

cal bus	detectors	LG 0	HG 1	LG 2	HG 3	LG 4	HG 5	LG 6	HG 7
HET I CAL A	A1, A2, C1, C3, SA		X		X				
HET I CAL B	B1, B2, C4			X	X				
HET II CAL A	A1, A2, C1, C3, SA						X		X
HET II CAL B	B1, B2, C4							X	X
TET CAL A	D1, D2, D3, D4, D5		X		X		X		X
TET CAL B	D6, D7			X	X			X	X
LET A CAL	L1, L2, L3, SL	X					X	X	X
LET B CAL	L1, L2, L3, SL		X			X		X	X
LET C CAL	L1, L2, L3, SL			X		X	X		X
LET D CAL	L1, L2, L3, SL				X	X	X	X	
	rates stimulated	R18	R1	R2	R3	R20	R9	R10	R11
		R25	R20	R5	R4	R22	R18	R13	R12
			R25	R22	R6	R24	R22	R18	R14
			R28	R26	R24	R25	R24	R20	R18
			R29		R26	R26	R25	R24	R20
					R28		R26	R25	R22
					R29		R28	R26	R25
							R29		R26
									R28
									R29

Approved _____ Date _____

6) Analog Multiplexer Data

The CRS will internally multiplex 24 analog measurements onto a single CRS-FDS analog line. The multiplexer will be controlled by a simple modulo-24 counter which is advanced once by each two signals on the CRS-FDS Analog Mux Step line. The multiplexer is reset by a signal on the CRS-FDS Analog Mux Reset line. The 24 parameters to be sampled are:

no.	name	description
1	v(+10)	+ 10 volt power supply voltage
2		
3	V(+6)	+ 6 volt "
4	V(+3)	+ 3 volt "
5	V(-3)	- 3 volt "
6	V(-6)	- 6 volt "
7	V(-12)	- 12 volt power supply voltage
8		
9		
10	TLA	LET A temperature
11	TLB	LET B temperature
12	TLC	LET C temperature
13	TLD	LET D temperature
14	THA	HET 1 temperature
15	THB	HET 2 temperature
16	TTT	TET temperature
17	TPC	Power converter temperature
18	TPP	Baseplate temperature
19	TPHA	PHA electronics temperature
20	TH2	HET2(left) side heater temperature
21	TH1	HET1(right) side heater temperature
22		
23		
24		

Approved _____ Date _____

1) Spacecraft Mechanical Configuration

Separate attachment.

Approved _____ Date _____

Log

MJS Log

TYPES of BLOCKS and CODE ASSIGNMENT

Block Identifier

Code	Description
00	Directory Block
01	Satellite block
02	Ency-Attribute block
03	EDR Control block
04	Library Control block
05	Work Control block
06	Encyclopedia Control Block
07	CITENCY Control block
13	EDR block
14	Library block
15	Work block
16	Encyclopedia block
17	CITENCY block

Structure of Processing Disposition Byte

type	Description
0	marked for processing
1	processing has begun
2	processing was completed
3	spare
4-7	processing completion code =0 no errors =1 errors dectected =15 serious error

Structure of Slot Allocation Status Byte

Bit	Description
0	slot allocation requested
1	slot allocated
2	slot is removable
3-7	spare

* bits are logically ORed on.

DIRECTORY BLOCK

Byte	Byte Length	Description
0	1	block identifier code, = 0
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type, = 0
6	2	Address of next block of this type, = 0
8	2	Number of blocks in data set - 6780
10	2	Address of last block allocated
12	2	Number of satellite entries
14	2	Maximum number of satellite entries, = 3
16	1	S/C id. code
17	1	Number of characters in satellite id.
18	12	Satellite id. (alphanumeric)
30	2	Address of Satellite block for this satellite
32-47	16	Same as 16-31 above for second satellite
48-63	16	Same as 16-31 above for third satellite

SATELLITE BLOCK

Byte	Byte Length	Description
0	1	Block identifier code, = 1
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type, = 0
6	2	Address of next block of this type, = 0
8	2	Address of first Ency-Attribute block
10	2	Address of EDR Control block
12	2	Address of Library Control block
14	2	Address of Work Control block
16	2	Address of Encyclopedia Control block
18	2	Address of CITENCY Control block

Byte	Byte Length		Description
0	1		block identifier code, = 2
1	1		Year of creation
2	1		Month of creation
3	1		Day of creation
4	2		Address of previous block of this type
6	2		Address of next block of this type
8	2		Record volume length in seconds
10	1		Data Quality Acceptance ON mask
11	1		Data Quality Acceptance OFF mask
12	4		Verse presence mask
16	2		Address of first work block
18	2		Address of first encyclopedia block
20	4		4 Character mnemonic for this encyclopedia
24	2		Address of last work block
26	2	NOT USED	~~Number of characters in encyclopedia title~~
28	4		~~Character title of Encyclopedia (alphanumeric)~~ First encyclopedia volume
32	4		Last encyclopedia volume
36	2		Last ENCY block
38	2		# of characters in title *
40	—		character title of encyclopedia. *

EDR CONTROL BLOCK

Byte	Byte Length	Description
0	1	block identifier code, = 3
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type, = 0
6	2	Address of next block of this type, = 0
8	2	Address of first EDR block
10	2	Address of last EDR block
12	2	Address of EDR block last modified
14	2	
16	4	First slot assigned to EDR's
20	4	Last slot assigned to EDR's

Byte	Byte Length	Description
0	1	block identifier code, = 4
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type, = 0
6	2	address of next block of this type, = 0
8	2	address of first library block
10	2	address of last library block
12	2	address of last library block modified
14	2	
16	2	first library volume serial
18	2	last library volume serial
20	4	first library slot
24	4	last library slot
28	2	last library volume serial written on
30	2	last data set sequence number on above
32	2	feet used on volume corresp. to last library serial above
34	2	Maximum amount of tape to be written (in feet) = 1800 feet
36	18	Model volume DSN (17 char) $V\begin{pmatrix}A\\B\end{pmatrix}.\underbrace{AA}_{\text{2 JPL characters}}\underbrace{XXXXXX}_{\text{JPL number}}$
54	6	Model volume serial = $M\begin{pmatrix}1\\2\end{pmatrix}W\emptyset\emptyset\emptyset$

Byte	Byte Length	Description
0	1	block identifier code, = 5
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type, = 0
6	2	Address of next block of this type, = 0
8	2	Address of 1st work block
10	2	Address of last work block
12	2	first work volume serial
14	2	last work volume serial
16	4	first work slot
20	4	last work slot
24	18	Model volume DSN (17 char)
		V(A/B).
42	6	Model volume serial
		M(1/2)WØØØØ
48	2	~~Address of block with next work volume serial~~
		LAST SERIAL USED

Byte	Byte Length	Description
0	1	block identifier code, = 6
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type, = 0
6	2	Address of next block of this type, = 0
8	2	Address of 1st Encylopedia block
10	2	1835 Address of last Encyclopedia block
12	2	first encyclopedia volume serial
14	2	last encyclopedia volume serial
16	4	first encyclopedia slot
20	4	last encyclopedia slot
24	6	Model Volume name (6 char)
30	2	034 Serial number of last used ency tape ~~Address of free encyclopedia volume block~~
32	2	Maximum ~~amount of tape to be written on~~ number of blocks to be written on ency tape
34	18	model dataset name.

CITENCY CONTROL BLOCK

Byte	Byte Length	Description
0	1	block identifier code, = 7
1	1	year of creation
2	1	month of creation
3	1	day of creation
4	2	Address of previous block of this type, = 0
6	2	Address of next block of this type, = 0
8	2	Address of first CITENCY block
10	2	Address of last CITENCY block
12	2	First CITENCY volume serial
14	2	Last CITENCY volume serial
16	4	First CITENCY slot
20	4	Last CITENCY slot
24	6	Model volume name (6 char)
30	2	Address of free CITENCY ~~volume block~~ last tape ser used
32	2	Maximum amount of tape to be written on
54	2	
60	4	LAST CIT VOLUME PROCESSED from ENCY TAPE USING ATTR W/ MNEMONIC 'bbbb'

EDR BLOCK

Byte	Byte Length		Description
0	1		block identifier code, = 13
1	1		Year of creation
2	1		Month of creation
3	1		Day of creation
4	2		Address of previous block of this type
6	2		Address of next block of this type
8	6		Volume Serial (JPL number)
14	2		2 Characters in JPL number
16	1	17	Slot allocation status
17	1		Year received
18	1		Month received
19	1		Day received
20	4		Slot number
24	2		Address of Library entry
26	2		Number of records
28	2		Number of errors
30	2		
32	2		
34	2	35/36	Number of entries that follow that were processed
36	1	37	Processing disposition
37	1		Year of processing
38	1		Month of processing
39	1		Day of processing
40-43	4		Same as 36-39 above
44-47	4		Same as 36-39 above
48-51	4	49-52	Same as 36-39 above

LIBRARY BLOCK

Byte	Byte Length	Description
0	1	block identifier code, = 14
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type
6	2	Address of next block of this type
8	8	Start FDSC
16	8	End FDSC
24	2	Library Tape volume serial
26	2	Library tape file sequence
28	2	Address of EDR block
30	2	Number of entries to follow that processing was completed
32	1	Processing disposition
33	1	Year of processing
34	1	Month of processing
35	1	Day of processing
36	2	Address of Ency-Attribute block
38	2	Address of work block
40-47	8	Same as 32-39 above
48-55	8	Same as 32- 39 above
56-63	8	Same as 32-39 above

WORK BLOCK

Byte	Byte Length	Description
0	1	block identifier code, = 15
1	1	Year of creation
2	1	Month of creation
3	1	Day of creation
4	2	Address of previous block of this type
6	2	Address of next block of this type
8	2	Address of Ency--Attribute block
10	2	Address of work block of same Ency--Attribute
12	2	Address of next work block of same attribute
14	2	Number of library blocks
16	4	Start record volume number
20	4	End record volume number
24	1	Merge processing disposition
25	1	Spare
26	2	Address of Encyclopedia block (NOT USED)
28	1	CITENCY processing disposition
29	1	spare
30	2	Address of CITENCY block
32	32	Address of library blocks corresponding to byte 14 above, each address takes 2 bytes

Byte	Byte Length	Description
0	1	block identifier code, = 16
1	1	year of creation
2	1	month of creation
3	1	day of creation
4	2	Address of previous block of this type
6	2	Address of next block of this type
8	2	Address of attribute block ←
10	2	Address of previous encyclopedia block for same Ency-Attribute
12	2	Address of next encyclopedia block for same Ency-Attribute
14	2	Current block count
16	4	Start record volume number
20	4	End record volume number
24	2	Volume serial of encyclopedia tape
26	2	Address of this block
28	1	Status of this block (0 - active; 1 - dead)
30	2	SLOT

CITENCY BLOCK

Byte	Byte Length	Description
0	1	block identifier code, = 17
1	1	year of creation
2	1	month of creation
3	1	day of creation
4	2	Address of previous block of this type
6	2	Address of next block of this type
8	2	Volume serial of 'raw verse only' encyclopedia
10	2	Volume serial of 'all but raw rates' encyclopedia
12	4	Slot of 'raw verse only'
16	4	Slot of 'all but raw rates'
20	1	slot allocation status
21	1	year sent
22	1	month sent
23	1	day sent
24	3	Date acknowledged, year month day
27	1	spare
28	2	Address of work block

Section III

Experiment Data Record Descriptions

3.1 COSMIC RAY SCIENCE (CRS) EXPERIMENT

The CRS EDR science record is designed to a 48-second instrument measurement period. Any data not present during the instrument measurement will be filled with binary zeroes.

A logical record corresponds to an instrument measurement period and in this instance is also the science physical record structure. The formats which follow are applicable to the GS, OC, and IM (imbedded GS&E) data modes.

The science logical/physical record structure is diagrammed in Figure 3.1-1 and the physical magnetic tape lay-out is shown in Figure 3.1-2. The physical magnetic tape lay-out includes a change in decommutation maps during the time period covered by that EDR tape. Figure 3.1-3 and 3.1-4 and Table 3.1-1 define the structure and contents of the CRS science record subheader. Figure 3.1-5 defines the CRS data word. Figure 3.1-6, and Table 3.1.2 define the science record data block structure and contents.

Appendix A contains the Decommutation Map record format. Appendix B describes the Engineering Record format. Appendix C depicts the Record Header which will be Standard on all the physical records written to the CRS EDR tape.

STANDARD HEADER (60-32 BIT WORDS)	SUBHEADER 10-32 BIT WORDS	SCIENCE DATA 520-32 BIT WORDS	= 80 MF (590 words)

Figure 3.1-1 CRS EDR Tape Record (Science)

STANDARD VOLUME (VOL 1) Label	IRG	STANDARD DATA SET (HDR 1) Header 1	IRG	STANDARD DATA SET (HDR 2) Header 2	IRG	TM	IRG	DECOMMUTATION MAP RECORD	IRG	Science Record 1							
IRG	IRG	Science Record 15*	IRG	Engineering Record 1 (12 min)	IRG	IRG	Science Record 1	IRG	IRG	Science Record 15 (48 sec.)	IRG						
DECOMMUTATION MAP RECORD +	IRG	Engineering Record 2 (12 min)	IRG	Sci. Rec.	Last Rec.	IRG	TM	IRG	EOF 1	IRG	EOF 2	IRG	TM	IRG	TM		

+ If Decom Map changed during processing interval for this EDR.

Figure 3.1-2 Physical Magnetic Tape Layout for CRS (GS,OC-1)

EDR DATA WORD	BITS 31 — 16	0 31 — 16	0
1	SPARE	INSTRUMENT COMMAND WORD	SPARE
3	STATUS WORD 0	STATUS WORD 1	STATUS WORD 2 / STATUS WORD 3
5	STATUS WORD 4	STATUS WORD 5	STATUS WORD 6 / STATUS WORD 7
7	SPARE		SPARE
9	SPARE		SPARE

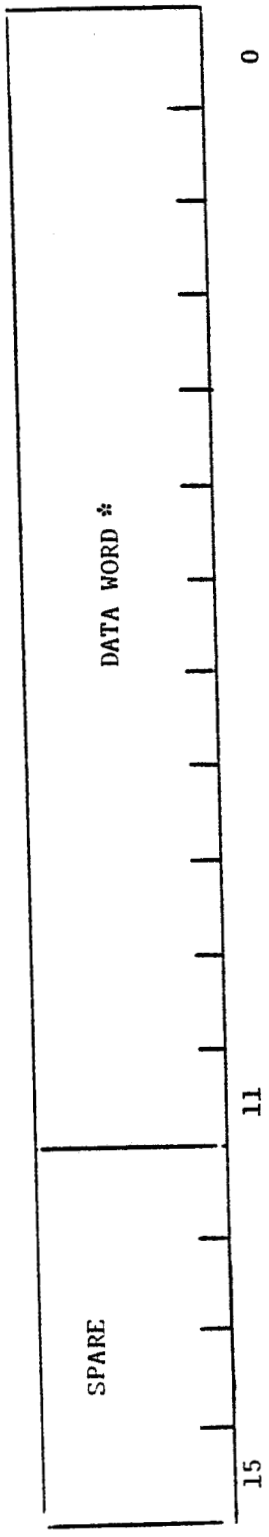
Figure 3.1-3 CRS Science Record Subheader Format (EVEN MOD 60)

EDR DATA WORD	BITS 31 — 16	0 31 — 16	0
1	SPARE	INSTRUMENT COMMAND WORD	SPARE
3	STATUS WORD 8	STATUS WORD 9	STATUS WORD 10 / STATUS WORD 11
5	STATUS WORD 12	STATUS WORD 13	STATUS WORD 14 / STATUS WORD 15
7	SPARE		SPARE
9	SPARE		SPARE

Figure 3.1-4 CRS Science Record Subheader Format (ODD MOD 60) (GS,OC-1)

Table 3.1-1 CRS Science Record Subheader Block Table (GS,OC-1)

Item	Word	Bits	Description			
1	1	31-16	Spare			
2	1	15-0	Instrument FDS command word			Subcom MF 61
3	2	31-0	Spare			
				EVEN	ODD	
4	3	31-16	Instrument Status word	0	8	Subcom MF 62
5	3	15-0	Instrument Status word	1	9	Subcom MF 62
6	4	31-16	Instrument Status word	2	10	Subcom MF 62
7	4	15-0	Instrument Status word	3	11	Subcom MF 62
8	5	31-16	Instrument Status word	4	12	Subcom MF 71
9	5	15-0	Instrument Status word	5	13	Subcom MF 71
10	6	31-16	Instrument Status word	6	14	Subcom MF 71
11	6	15-0	Instrument Status word	7	15	Subcom MF 71
12	7	31-0	Spare			
13	8	31-0	Spare			
14	9	31-0	Spare			
15	10	31-0	Spare			



* Zeros will be used as filler.

Figure 3.1-5 CRS Science Data Word (GS,OC-1)

EDR DATA WORD	BITS 31 24 16 8 0	31 24 16 8 0		
1	PHA_1 WORD MF 1	PHA_1 WORD MF 1	PHA_1 WORD MF 1	PHA_1 WORD MF 1
3	RATE WORD 1 MF 1	RATE WORD 2 MF 1	PHA_2 WORD MF 1	PHA_2 WORD MF 1
5	PHA_2 WORD MF 1	PHA_2 WORD MF 1	RATE WORD 3 MF 1	PHA_3 WORD MF 1
7	PHA_3 WORD MF 1	PHA_3 WORD MF 2	PHA_3 WORD MF 2	RATE WORD 4 MF 2
9	PHA_4 WORD MF 2	PHA_4 WORD MF 2	PHA_4 WORD MF 2	PHA_4 WORD MF 2
11	RATE WORD 5 MF 2	PHA_5 WORD MF 2	PHA_5 WORD MF 2	PHA_5 WORD MF 2
13	PHA_5 WORD MF 2	RATE WORD 6 MF 2	PHA_6 WORD MF 3	PHA_6 WORD MF 3
15	PHA_6 WORD MF 3	PHA_6 WORD MF 3	RATE WORD 7 MF 3	RATE WORD 8 MF 3
17	PHA_7 WORD MF 3	PHA_7 WORD MF 3	PHA_7 WORD MF 3	PHA_7 WORD MF 3
19	RATE WORD 9 MF 3	PHA_8 WORD MF 3	PHA_8 WORD MF 3	PHA_8 WORD MF 4
21	PHA_8 WORD MF 4	RATE WORD 10 MF 4	PHA_9 WORD MF 4	PHA_9 WORD MF 4
23	PHA_9 WORD MF 4	PHA_9 WORD MF 4	RATE WORD 11 MF 4	PHA_{10} WORD MF 4
25	PHA_{10} WORD MF 4	PHA_{10} WORD MF 4	PHA_{10} WORD MF 4	RATE WORD 12 MF 4
	THE ABOVE STRUCTURE IS REPEATED 19			
	MORE TIMES TO COMPLETE THE RECORD			
	OF 520 32-BIT WORDS			

4 MFs

4

26 words

Figure 3.1-6 CRS Science Data Block Format (GS,OC-1)

PHA rate ||: 4 2 4 , 2 | 2 , 4 , 4 , :||

mf 1 mf 2

4 mf complete 10 PHA readouts
12 rate readouts

30 rate 1 cycle
25 PH
m 653

Table 3.1-2 CRS EDR Science Data Block Table (GS,OC-1)

Item	Word	Bits	Description	
1	1	31-16	PHA_1 word	MF 1
2	1	15-0	PHA_1 word	MF 1
3	2	31-16	PHA_1 word	MF 1
4	2	15-0	PHA_1 word	MF 1
5	3	31-16	RATE word 1	MF 1
6	3	15-0	RATE word 2	MF 1
7	4	31-16	PHA_2 word	MF 1
8	4	15-0	PHA_2 word	MF 1
9	5	31-16	PHA_2 word	MF 1
10	5	15-0	PHA_2 word	MF 1
11	6	31-16	RATE word 3	MF 1
12	6	15-0	PHA_3 word	MF 1
13	7	31-16	PHA_3 word	MF 1
14	7	15-0	PHA_3 word	MF 2
15	8	31-16	PHA_3 word	MF 2
16	8	15-0	RATE word 4	MF 2
17	9	31-16	PHA_4 word	MF 2
18	9	15-0	PHA_4 word	MF 2
19	10	31-16	PHA_4 word	MF 2
20	10	15-0	PHA_4 word	MF 2
21	11	31-16	RATE word 5	MF 2
22	11	15-0	PHA_5 word	MF 2
23	12	31-16	PHA_5 word	MF 2
24	12	15-0	PHA_5 word	MF 2
25	13	31-16	PHA_5 word	MF 2
26	13	15-0	RATE word 6	MF 2
27	14	31-16	PHA_6 word	MF 3
28	14	15-0	PHA_6 word	MF 3
29	15	31-16	PHA_6 word	MF 3
30	15	15-0	PHA_6 word	MF 3
31	16	31-16	RATE word 7	MF 3

Table 3.1-2 CRS EDR Science Date Block Table (contd)

Item	Word	Bits	Description	
32	16	15-0	RATE word 8	MF 3
33	17	31-16	PHA_7 word	MF 3
34	17	15-0	PHA_7 word	MF 3
35	18	31-16	PHA_7 word	MF 3
36	18	15-0	PHA_7 word	MF 3
37	19	31-16	RATE word 9	MF 3
38	19	15-0	PHA_8 word	MF 3
39	20	31-16	PHA_8 word	MF 3
40	20	15-0	PHA_8 word	MF 4
41	21	31-16	PHA_8 word	MF 4
42	21	15-0	RATE word 10	MF 4
43	22	31-16	PHA_9 word	MF 4
44	22	15-0	PHA_9 word	MF 4
45	23	31-16	PHA_9 word	MF 4
46	23	15-0	PHA_9 word	MF 4
47	24	31-16	RATE word 11	MF 4
48	24	15-0	PHA_{10} word	MF 4
49	25	31-16	PHA_{10} word	MF 4
50	25	15-0	PHA_{10} word	MF 4
51	26	31-16	PHA_{10} word	MF 4
52	26	15-0	RATE word 12	MF 4
			(The structure shown above is repeated 19 more times to complete the block of 520 32-bit words.)	

APPENDIX C

STANDARD EDR HEADER FORMAT

The Standard Record Header described in the following pages is designed to be utilized as the record header for all physical records written to and EDR tape.

Part A of this section describes the Standard Record Header to be written as part of every GS, OC, and IM derived science record. The contents and record structure are described in Figure C-1 and Table C-1.

Part B of this section describes the Standard Record Header to be written as part of every CR-6 derived science record. The contents and record structure are described in Figure C-2 and Table C-2.

Part C of this section describes the Standard Record Header to be written as part of every Engineering record. The contents and record structure are described in Figure C-3 and Table C-3.

Part D of this section describes the Standard Record to be written as part of every CR-2 derived science record. The contents and structure are described in Figure C-4 and Table C-4.

Part E of this section describes the Standard Record to be written as part of every Monitor record. The contents and structure are described in Figure C-5 and Table C-5.

Part F of this section describes the Standard Record to be written as part of every CR-1 derived science record. The contents and structure are described in Figure C-6 and Table C-6.

Part G of this section describes the Standard Record to be written as part of every CR-1 derived science record. The contents and structure are described in Figure C-7 and Table C-7.

For interpretation of day number and hour of day from hour of year, divide the number of hours by 24. The whole number is the day, the remainder is the hour of that day.

Examples:

36 Hours

```
      1
24/36 = Day 1, Hour 12 - Jan 1, 12 PM
     24
     12
```

3500 Hours

```
       145
24/3500 = Day 145, Hour 20 - May 25, 8 PM
      24
      110
       96
       140
       120
        20
```

PART A (GS, OC, IM)

Standard Record Header for extracted data from data modes GS-2, GS-3, GS-4, OC-1, IM-1 thru IM-12, PB-1, PB-2, and PB-3. If the source data for PB-4 and PB-5 was one of the above, then this record header will be used.

NOTE: Data Presence and Golay Correction Flags.

1) GS Type Records:
A pair of 8-bit words appear in the standard header for each minor frame (160 per 80 MF record). Ths first word is used to indicate data presence, the second indicates Golay correction. Only the 5 LSB bits are significant. Each of the 5 bits corresponds to one of the five 432-bit segments that constitute one GS type MF (extracted).

The bit assignments are:

BIT	BITS OF MF REPRESENTED
4	1 - 432
3	433 - 864
2	865 - 1296
1	1297 - 1728
0	1729 - 2160
5, 6, 7	Spares (=0)

The bit definitions are:

For data presence	1 = filler data
	0 = data present
For Golay Correction	1 = Golay corrected
	0 = Not Golay corrected

For non-segmented (non-extracted) GS type data, all the bits in the word are "ganged" together and set to one value (0 or 1).

2) Non-Golay Type Records:
Only data presence words are available and are defined as above for non-segmented GS type data. All bits are "ganged" and set to 0 or 1. The unused bits (Golay words in GS type records) are blocked as filler bits following the data presence words.

EDR DATA WORD	BIT 31 – 24	16 – 8	0	31 – 24	16 – 8	0
1	PROJECT IDENTIFICATION	REC. ID	S/C ID	PHYSICAL RECORD NUMBER	S/C DATA MODE	A / B / SPARE
3	STARTING ERT HOUR OF CURRENT YEAR	STARTING ERT SECOND OF CURRENT HR.		STARTING ERT MILLISECOND OF CURR SEC	YEAR	C / D / SEG. NO.
5	ENDING ERT HOUR OF CURRENT YEAR	ENDING ERT SECOND OF CURRENT HOUR		ENDING ERT MILLISECOND OF CURR SEC	YEAR	SOFTWARE VERSION
7	SCET HOUR OF CURRENT YEAR	SCET SECOND OF CURRENT HOUR		SCET MILLISECOND OF CURR SEC	YEAR	SCE FLAG / FDSC CORR FLAG
9	MOD 2^{16} COUNT	MOD 60 COUNT	LINE COUNT	DOWNLINK TLM RATE	EFFECTIVE EXPERIMENT BIT RATE	FID
11	BET / DSN CONFIG	GROUND RECEIVER AGC		DSN STATION	SPARE	PN EBEC
13	SYMBOL SNR	DECODER SNR		PHYSICAL RECORD NO. OR UNUSED	DQSW *MF 17 - MF 24 MF 1 - MF 8	
15	DQSW *MF 25 - MF 32 MF 9 - MF 16	DQSW *MF 33 - MF 40 MF 17 - MF 24		DQSW *MF 41 - MF 48 MF 25 - MF 32	DQSW *MF 49 - MF 56 MF 33 - MF 40	
17	DQSW *MF 57 - MF 64 MF 41 - MF 48	DQSW *MF 64 - MF 72 MF 49 - MF 56		DQSW *MF 73 - MF 80 MF 57 - MF 64	DQSW *MF 1 - MF 8 MF 65 - MF 72	
19	DQSW *MF 9 - MF 16 MF 73 - MF 80	DPI *MF 17 MF 1	GCI *MF 17 MF 1	DPI *MF 18 MF 2	GCI *MF 18 MF 2	DPI *MF 19 MF 3 / GCI *MF 19 MF 3
⋮	... ...					
59	DPI *MF 16 MF 80	GCI *MF 16 MF 80	IRIS DPI MF 17	IRIS GCI MF 17	DRS DATA TYPE	GOLAY CORRECTION BEC / GOLAY BIT ERROR SUMMATION

check for engineering

A = Engineering Flag
B = S/C Playback Flag
C = Data Source
D = Golay Encoded Flag

* These fields require a special minor frame definition for IRIS and ENG EDRS

Figure C-1. Standard Experiment Data Record Header

Table C-1.

Standard

Experiment Data Record Header

Item	Word	Bits	Description
1	1	31-8	Project Identification - Identifies this tape as being written by the MJS77 project. The letters M, J, and S will be written in EBCDIC. HEX: D4, D1, E2
2	1	7-4	Record Identification - Identifies which experiment and data subgroup to which this record pertains. 0000 = Spare 0001 = CRS Science Record 0010 = IRIS (Unused in CR Modes) 0011 = LECP Science Record 0100 = MAG Science Record 0101 = PLS Science Record 0110 = PPS Science Record 0111 = PRA Science Record 1000 = PWS Science Record 1001 = UVS Science Record 1010 = RSS Science Record 1011 = Engineering Record (DQSW = ZEROs) 1100 = Unused 1101 = Imaging Status Record (DQSW = ZEROs) 1110 = Monitor Record (DQSW = ZEROs) 1111 = Decommutation Map Record (DQSW = ZEROs)
3	1	3-0	Spacecraft Identification - Identifies the spacecraft transmitting this data. 0000 = Flt 2 0001 = Flt 1 0010 = PTM 0011 = Unknown 0100 = SIM 1 (S/C 41) 0101 = SIM 2 (S/C 42) 0110 = ... 1111 = Unused

Table C-1

Standard

Experiment Data Record Header

(GS, OC, IM)

Item	Word	Bits	Description
4	2	31-16	Physical Record Number - Sequential binary count of all physical records written on this EDR tape. The count is incremented by one after each successful write. This number is initially set to one (1).
5	2	15-8	Data Mode - Contains the telemetry format with respect to data content and data rate. 00_{16} = Engineering Zero - (See FID) 01_{16} = CR-2 02_{16} = CR-3 03_{16} = CR-4 04_{16} = CR-5 05_{16} = CR-6 06_{16} = Unused 07_{16} = CR-1 08_{16} = Unused 09_{16} = IM-7 $0A_{16}$ = GS-3 $0B_{16}$ = IM-9 $0C_{16}$ = PB-3 $0D_{16}$ = PB-2 $0E_{16}$ = PB-1 $0F_{16}$ = GS-4 10_{16} = Unused 11_{16} = GS-2 12_{16} = IM-14 13_{16} = Unused 14_{16} = IM-12 15_{16} = IM-11 16_{16} = IM-10 17_{16} = OC-1 18_{16} = IM-8

Table C-1

Standard (GS, OC, IM)

Experiment Data Record Header

Item	Word	Bits	Description
5	2	15-8	19_{16} = Unused $1A_{16}$ = IM-6 $1B_{16}$ = IM-5 $1C_{16}$ = IM-4 $1D_{16}$ = IM-3 $1E_{16}$ = IM-2 $1F_{16}$ = IM-13
6	2	7-6	Engineering Extraction Flag - Identifies whether the engineering data was extracted out of another data stream or was the primary data stream. 00 = stand-alone 11 = extracted
7	2	5	S/C Playback - Indicates that the data in this record is Spacecraft tape recorder playback data. 0 = no 1 = yes This flag is set only for data extracted from PB-1, PB-2, and PB-3 telemetry mode data.
8	2	4-0	Spare Starting Earth Received Time - Greenwich Mean Time (GMT) of the first PN bit of the first minor frame (MF) and contained in this record from which this record's prime data is extracted. Binary representation will be used.
9	3	31-16	Hour of Current Year - Binary hours since the beginning of the current year. See last paragraph Page C-2
10	3	15-0	Seconds of Current Hour - Binary seconds since the beginning of current hour.

Table C-1.

Standard

Experiment Data Record Header

Item	Word	Bits	Description
11	4	31-16	Milliseconds of Current Second - Binary milliseconds.
12	4	15-8	Year - Binary year (i.e., 77, 78).

Standard

Experiment Data Record Header

Item	Word	Bits	Description
13	4	7-6	Data Source - Contains information as to whether the data was derived from an IDR or Multiple Wide Band data (which indicates that the data was logged at the station and then transmitted to JPL from the log tapes). 00_2 = Unused 01_2 = Real-Time 10_2 = IDR 11_2 = Replay
14	4	5-4	Golay Encoded Flag - Indicates that the data in this record have been Golay coded for transmission to Earth and decoded upon Receipt at Earth, so any corrections will be flagged in the header of this record. 00_2 = Not Golay Decoded 01_2 = Golay Decoded 10_2 = Unused 11_2 = Unused
15	4	3-0	Segment Number - Other than those in the table below are zeros:

INSTRUMENT/ DATA MODE	SEG NO.	SEGS WITH MFs	MOD60 COUNT
PPS/OC-1	1	1-20	
	2	21-40	
	3	41-60	
	4	61-80	
PPS/CR-1,2&GS	1		0,5,10....55
	2	GS=1-80	1,6,11....56
	3	CR-1=1-80	2,7,12....57
	4	CR2=1-40	3,8,13....58
	5		4,9,14....59
PWS/CR-6	1	1-50	
	2	51-100	
	3	101-150	

Standard (GS, OC, IM)

Experiment Data Record Header

Item	Word	Bits	Description
			INSTRUMENT/ DATA MODE — SEG NO. — SEGS WITH MFs — MOD60 COUNT
			LECP/CR-1, 2 — 1 — CR-1=1-80 — Even
			2 — CR-2=1-40 — Odd
			LECP/CR-6 — 1 — 1-75
			2 — 76-150
			MAG/CR-6 — 1 — 1-75
			2 — 76-150
			CRS/CR-6 — 1 — 1-30
			2 — 31-60
			3 — 61-90
			4 — 91-120
			5 — 121-150
			UVS/GS — 1 — 1-80 — Even
			2 — 1-80 — Odd
			UVS/OC-1 — 1 — 1-8
			2 — 9-16
			3 — 17-24
			4 — 25-32
			5 — 33-40
			6 — 41-48
			7 — 49-56
			8 — 57-64
			9 — 65-72
			10 — 73-80
			PLS/CR-6 — 1 — 1-75
			2 — 76-150
			IRIS/GS (if 144 Sec. Scan) — 1 — 17-17 — 0,3,6....57
			2 — 17-17 — 1,4,7....58
			3 — 17-17 — 2,5,8....59
			Ending Earth Received Time - GMT of the first bit of the last MF that is received and contained in this record from which this record's prime data is extracted.
16	5	31-16	Hour of Current Year - Binary hours since the beginning of the current year. See last par. page C-2.
17	5	15-0	Seconds of Current Hour - Binary seconds since the beginning of the current hour.
18	6	31-16	Millisecond of Current Second - Binary milliseconds.
19	6	15-8	Year - Binary year (i.e., 77, 78).

Table C-1.

Standard

Experiment Data Record Header

(GS, OC, IM)

Item	Word	Bits	Description
20	6	7-0	Software Version - Contains identification (in binary) of the software system operating in the computer string which created the current record. Spacecraft Event Time - Greenwich Mean Time (GMT) that corresponds to the Spacecraft Time of the first MF from which this records prime data was extracted, in Binary representation. The format is as follows:
21	7	31-16	Hour of Current Year - Binary hours since the beginning of the current year. See Last paragraph Page C-2
22	7	15-0	Seconds of Current Hour - Binary number of seconds since the beginning of the current hour.
23	8	31-16	Milliseconds of Current Second - Binary milliseconds.
24	8	15-8	Year - Binary year (i.e., 77,78).
25	8	7-4	Spacecraft Event Time Flag -0=input by NORT file. 1=input by EDR PROC. Either all 0's or all 1's
26	8	3-0	FDSC Correction Flag - Indicates that FDSC has been corrected in some manner. (Binary) There is one bit for MOD 2, one for MOD 60 and one for line counts also. (1=corrected, 0=OK) 3=Spare. 2=MOD 2. 1=MOD 60. 0=L.C.
27	9	31-16	MJS MOD 2^{16} Count Word - Contains the 16-bit MM subcom time word for this record. Is incremented every 48-minutes.
28	9	15-8	MJS MOD 60 Count Word - Contains the module 60-spacecraft time as created within the FDS for the first minor frame received that is contained in this record. Increments every 48-seconds.
29 30	9 10	7-0 31-24	MJS Line Count Word - Contains the ISS line count which ranges between 1 and 800. Increments every 0.06 second.
31	10	23-16	Downlink Telemetry Rate - Contains the rate at which the MJS spacecraft transmitted the telemetry data to earth. (i.e., 40 to 115,200 bits/second). (Binary Code) 00_{16} = Unused 01_{16} = 10 BPS 02_{16} = 20 BPS

Table C-1
Standard
Experiment Data Record Header

GS, OC, IM)

Item	Word	Bits	Description
32	10	23-16	03_{16} = 40 BPS; 04_{16} = 80 BPS; 05_{16} = 160 BPS; 06_{16} = 320 BPS; 07_{16} = 640 BPS; 08_{16} = 1200 BPS; 09_{16} = 1280 BPS; $0A_{16}$ = 2560 BPS; $0B_{16}$ = 7200 BPS; $0C_{16}$ = 19,200 BPS; $0D_{16}$ = 21,600 BPS; $0E_{16}$ = 29,866 2/3 BPS; $0F_{16}$ = 44,800 BPS; 10_{16} = 67,200 BPS; 11_{16} = 89,600 BPS; 12_{16} = 115,200 BPS; 13_{16} = 33,600 BPS; 14_{16} = 57,600 BPS
33	10	15-8	Effective Rate - Contains the effective bit rate of this data within the downlink telemetry rate. (Refer to downlink telemetry rate code)
34	10	7-0	FID-Format ID word used only for Engineering record (Extracted from telemetry data stream) Bits 7 & 6 Format Type 0 0 Engineering without AACS Memory Readout 0 1 Engineering with AACS Memory Readout 1 0 Imaging/Playback 1 1 GS & E Bits 5 & 4 Engineering Data Rate (bps) 0 0 10 0 1 40 1 0 1200 1 1 7200 (1200 recorded) Bits 3,2,1 Engineering Data Mode 0 0 0 Launch 0 0 1 Cruise 0 1 0 Encounter 0 1 1 TCM 1 0 0 Special 1 0 1 Science Maneuver 1 1 0 CCS Memory Readout 1 1 1 FDS Memory Readout Bit 0 Spacecraft ID 1 = FLT 1 0 = FLT 2

Table C-1

Standard

(GS, OC, IM)

Expriment Data Record Header

Item	Word	Bit	Description
35	11	31-24	Bit Error Tolerance (BET) - Contains the PN bit error tolerance during frame synchronization. (Binary)
36	11	23-16	DSN Equipment Configuration- Contains the latest status of any change in station equipment configuration during the time corresponding to the first MF received in this record. BIT 23-21 = RECIVER (23=MSB) 001 = #1 010 = #2 011 = #3 100 = #4 BIT 20-18 = SUBCARRIER DEMODULATOR (SDA)(20=MSB) 001 = #1 010 = #2 011 = #3 100 = #4 BIT 17-16 = TELEMETRY PROCESSOR (TPA) (17=MSB) 00 = Telemetry Processor (TPA) #1, Symbol Synchronizer (SSA) #1 (TPA #3 at conjoint station) 01 = TPA #1 (or 3), SSA #2 10 = TPA #2, SSA #3 11 = TPA #2, SSA #4

Table C-1

Standard (GS, OC, IM)

Experiment Data Record Header

Item	Word	Bits	Description
37	11	15-0	Receiver Automatic Gain Control (AGC) - Contains the AGC extracted from the GCF block from which the first minor frame received was derived. (Binary)
38	12	31-24	DSN Station Number - Contains the identification number of the DSN station originating the data contained in the first minor frame received of this record. (Binary)
39	12	23-16	Spare
40	12	15-0	Estimated Bit Error Count(EBEC)-Count of the number of bits in error, looking at the first 64 bits of each prime MF over N number of frames. The count resets upon frame time domain or DSS change. Placed in header on LAD basis. Frame Time — Expected Frame Accumulated .06 Sec — 15625 .4,.6,1.2,2.4,4.8 — 1562 9.6,12.0,19.2 — 156
41	13	31-16	Symbol Signal-to-Noise Ratio (SNR) - Contains the symbol SNR extracted from the GCF block from which the first minor frame received was derived. (Binary)
42	13	15-0	Decoder SNR - Bit Error Rate out of the Data Decoder Assembly.
43	14	31-16	Physical Record Number A. For individual EDRs: Unused (set to zeros) B. For combined EDRs: Physical Record number in binary.
44	14	15-8	DQSW Data Quality Status Word for MF-1 through MF-8. For IRIS see page C-16 Station Lock Status Bit 15 = Unused Bit 14 = Unused Bit 13 = Unused Bit 12 = Receiver Bit 11 = SDA Bit 10 = SSA Bit 9 = MCD Bit 8 = TPA

14/4/56 (54)

Table C-1.

Standard

Experiment Data Record Header

Item	Word	Bits	Description
45	14	7-0	**Data Quality Indicators** Bit 7 = Unused Bit 6 = Unused Bit 5 = Unused Bit 4 = PN Error Outside BET (0=none, 1=bit errors exceed BET) Bit 3 = PN Error Within BET (0=none, 1=bit errors) Bit 2 = SPARE Bit 1 = Valid Data Flag (0=valid, 1=no data) Bit 0 = GCF Block Error (0=no, 1=yes)
46	15	31-16	DQSW for MF9-MF16
47	15	15-0	DQSW for MF17-MF24
49	16	31-16	DQSW for MF25-MF32
49	16	15-0	DQSW for MF33-MF40
50	17	31-16	DQSW for MF41-MF48
51	17	15-0	DQSW for MF49-MF56
52	18	31-16	DQSW for MF57-MF64
53	18	15-0	DQSW for MF65-MF72
54	19	31-16	DQSW for MF73-MF80
55-216	19-59	Descrip. follows	**Data Presence and Golay Correction Indicators** Two 8 bit fields to indicate Data Presence and Golay Correction are supplied for each of the 80* MF contained in this record. The low order 5 bits in an 8-bit field indicate[1] a) Data Presence (1=filler, 0=data) or b) Golay Correction (1=corrected, 0= not corrected) for 1 segment of the GS MF and are defined as: BIT POSITION (7-0, left to right) — BITS IN GS MF BEING FLAGGED 4 — 1-432 3 — 433-864 2 — 865=1296 1 — 1297-1728 0 — 1729-2160

* for IRIS see Page C-17

[1] For non-segmented data, the entire byte is set to one value.

Table C-1.

Standard (GS, OC, IM)

Experiment Data Record Header

Item	Word	Bits	Description
55	19	15-8	Data Presence Indicators for MF-1
56	19	7-0	Golay Correction Indicators for MF-1
. . .	. . .	. . .	. . .
213	59	31-24	Data Presence Indicators for MF-80 (for IRIS = MF-16)
214	59	23-16	Golay Correction Indicators for MF-80
215	59	15-8	Data Presence Indicators for IRIS = MF-17
216	59	7-0	Golay Correction Indicators for IRIS = MF-17
217	60	31-24	DRS Data Type - Numbers are in HEX IRIS = 20, CRS = 21, LECP = 22, MAG = 23, PLS = 24, PPS = 25, PRA = 26, PWS = 27, UVS = 28 ISR = 29, DCOM = 2A, MONITOR = 2B, DCMS = 2C, ENGE = 2D, ENGS = 2E
218	60	23-16	Golay Correction Bit Error Count-Count of PN errors in a 48 sec. period (80 MF) which are in error. Maximum count displayed will be 255.
219	60	15-0	Golay Bit Error Summation - total number of bits modified by the Golay Correction algorithm during a major frame.

Appendix C

THE VOYAGER COSMIC RAY TELESCOPE DATA COLLECTION SYSTEM

There are 30 24-bit binary rate counters on the Voyager-1 and -2 spacecraft. Counters R1 to R8 are used to accumulate data from the first HET telescope, and counters R9 to R16 are used to accumulate data from the second HET. Table C1 indicates what rate information is accumulated by each of the counters for various telemetry subcom states. A definition of the various symbols used in Table C1 is given in Table C2. Also shown in Table C1 and C2 is the information accumulated by LET-A (see counters R17, R18, and R25), LET-B (see counters R19, R20, and R25), and the TET (see counters R28 to R30). Similar information for LET-C and LET-D is accumulated in counters R21 to R24 and R26. Note that counter R27 is used as a spare counter. From these tables, it can be seen that the system can detect 45 different coincidence/anticoincidence logic conditions corresponding to various particle types with separate energy windows and originating from various telescopes. Also, 56 different "singles" rates are sent which originate from only one detector.

The Voyagers also have eight 4096-channel pulse height analyzers (PHAs) for three parameter analysis of selected events. A group of three PHAs is referred to as a PHA block and is shared by the HET and two LETs. A second PHA block is shared by the other HET and the other two LETs. The final two PHAs are utilized by the TET. When data is to be sent to the ground, a polling system connected to each PHA block scans sequentially through eight event register positions (e.g., LET-SL* (also called LET-S1), LET-SL (also called LET-S2), TET, HET-AS (also called HET-S1), LET-SL*, LET-SL, HET-BS (also called HET-S2), and HET-PEN (also called HET-P), see next paragraph). When the polling system

finds data, it holds that position until the data are read out and then advances to the next position. A block select system sends the information in the PHA data block if only one block has data, or its alternates between blocks if both have data. This polling system will more regularly record PHA events than the earlier Pioneer system which did not have a method for determining if a particular PHA register had data and, consequently, often sent zeros in the telemetry stream.

As mentioned earlier, various event register positions are recognized by the electronics including two stopping (AS and BS) and one penetrating (PEN). These events are described further in Tables C3 and C4. For the HET telescopes, event type AS (i.e., S1) represents particles which enter through detectors A1 and A2, but do not exit through the guards, G, or detector C4. BS (i.e., S2) events are stopping particles which enter the B side and PEN (i.e., P) type events penetrate detectors B1 and B2 and the complete C detector stack. Similar event register positions are used for pulse height analysis of the LET and TET systems. Each event type is stored in a 48-bit register dedicated to that event type. Each polling block has five registers. The TET system has one register that may be sampled by either polling block. Between readouts, the polling system scans the event registers in the sequence LETSL*, LETSL, HETAS, HETBS, LETSL*, LETSL, HETPEN, TET, stopping only at a full register. The block select system toggles alternately between blocks if both have data available or selects data from the appropriate block if only one has data. If both blocks are empty, 48 zeros are read out. The format of the 48-bit word used for PHA events is shown in Table C5. To understand this format, one needs to know the definition of the PHA tag word shown in Table C6, and the detector elements which are read out during a HETAS, HETBS, HETP, LET, or TET PHA event shown in Table C7. (Note: In Table C7 the symbol LA3 means detector LET-A, element L3 and the symbol LB3 means detector LET-B, element L3. Other symbols have been defined previously).

Rate table

SB	R1	R2	R3	R4	R5	R6	R7	R8	R17	R18	R19	R20	R25	R28	R29	R30
0	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	A1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA1	TAN	TLO	D6L
1	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	A2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA2	TAN	THI	GA + GB
2	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	C1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA3	TAN	TLO	D5H
3	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	C2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA4	TAN	THI	D7L
4	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D6H
5	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D7H
6	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D5L
7	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D8L
8	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	C3	LAZ3*	LAZ3	LBZ3*	LBZ3	LB1	TAN	TLO	D1H
9	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	C4	LAZ3*	LAZ3	LBZ3*	LBZ3	LB2	TAN	THI	D4H
10	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	B2	LAZ3*	LAZ3	LBZ3*	LBZ3	LB3	TAN	TLO	D2L
11	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	G1	LAZ3*	LAZ3	LBZ3*	LBZ3	LB4	TAN	THI	D3L
12	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D1L
13	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D3H
14	ASZ3	BSZ2	PEN	PG	BS4Z2	BS3Z2	BS2Z2	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D2H
15	ASZ3	BSZ2	PEN	PG	BS4Z2*	BS3Z2*	BS2Z2*	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D4L
16	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	A1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA1	TAN	TLO	D6L
17	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	A2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA2	TAN	THI	GA + GB
18	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	C1	LAZ3*	LAZ3	LBZ3*	LBZ3	LA3	TAN	TLO	D5H
19	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	C2	LAZ3*	LAZ3	LBZ3*	LBZ3	LA4	TAN	THI	D7L
20	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D6H
21	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D7H
22	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D5L
23	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D8L
24	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	C3	LAZ3*	LAZ3	LBZ3*	LBZ3	LB1	TAN	TLO	D1H
25	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	C4	LAZ3*	LAZ3	LBZ3*	LBZ3	LB2	TAN	THI	D4H
26	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	B2	LAZ3*	LAZ3	LBZ3*	LBZ3	LB3	TAN	TLO	D2L
27	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	G1	LAZ3*	LAZ3	LBZ3*	LBZ3	LB4	TAN	THI	D3L
28	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	B1	LAZ3*	LAZ3	LBZ3*	LBZ3	LASL	TAN	TLO	D1L
29	AS	BSp	PEN	PG	BS4e	BS3e	BS2e	SA1	LAZ3*	LAZ3	LBZ3*	LBZ3	LBSL	TAN	THI	D3H
30	AS	BSp	PEN	PG	BS4p	BS3p	BS2p	SA2	LAZ3*	LAZ3	LBZ3*	LBZ3	LATRP	TAN	TLO	D2H
31	AS	BSe	PEN	PG	BS4e	BS3e	BS2e	SB	LAZ3*	LAZ3	LBZ3*	LBZ3	LBTRP	TAN	THI	D4L

SB = Subcom state = S1 + 2.S2 + 4.S3 +8.S4 + 16.S5 S5 = HG
Rate table is for AUTO mode. When CRS is commanded to HG or HG* mode only the bottom or top half is read out.
Note that there are actually two high gain bits.

Table C1 - Voyager Rate Telemetry Information

HET 5) Rates and Analysis

HET 1 is described; HET 2 is similar.

Name	Accum Number	Gain (S5)	Subcom State (S1 - S4)	Simplified Logic Equation	Description
AS	R1	HG	all	A1.A2.C4*.G1*	All nuclei of appropriate range, 0.15 to 15.3 mm Si nominal. Electrons eliminated by thin A detectors.
ASZ3	R1	LG	all	A1.A2.SA.C4*.G3*	All nuclei of Z>=3 of appropriate range, 0.15 to 15.3 mm Si nomir Z<3 eliminated by slant, SA.
BSZ2	R2	LG	all	B1.B2.SB.C1*.G3*	All nuclei of Z>=2 of appropriate range, 2 to 22 mm Si nominal. Electrons, Z=1 eliminated by slant, SB.
BSp	R2	HG	S1=0 or S2=0(3/4)	B1.B2.SB.C1*.G1*	All nuclei of appropriate range, 2 to 22 mm Si nominal.
BSe	R2	HG	S1=S2=1 (1/4)	B1.B2.C4.SB*.C1*.G1*	Electrons of appropriate range, 4 to 22 mm Si nominal. Nuclei eliminated by slants.
PEN	R3	both	all	B1.B2.C1	All particles of range greater than 22 mm Si nominal.
PG	R4	both	all	PEN.G1*	Same as PEN, but some heavies lost due to knock-ons and cross-ta in guards.
BS4Z2*	R5	LG	odd (S1=1)	B1.B2.C4.C3*.SB*.G1*	Protons of appropriate range, 4 to 10 mm. Z>=2 eliminated by sl Most electrons eliminated by high thresholds on B1 and B2.
BS4Z2	R5	LG	even (S1=0)	B1.B2.C4.C3*.SB.G1*	Z>=2 of appropriate range, 4 to 10 mm.
BS4e	R5	HG	odd	B1.B2.C4.C3*.SB*.G1*	Electrons of 4 to 10 mm. Nuclei eliminated by slant.
BS4p	R5	HG	even	B1.B2.C4.C3*.SB.G1*	Nuclei of 4 to 10 mm. Electrons eliminated by slant.
BS3Z2*	R6	as above		- - C4.C3.C2* - -	As above, except nominal range of 10 to 16 mm Si.
BS3Z2					
BS3e					
BS3p					
BS2Z2*	R7	as above		- - C4.C3.C2.C1* - -	As above, except nominal range of 16 to 22 mm Si.
BS2Z2					
BS2e					
BS2p					

Analysis is tied to rates R1, R2, and R3. Buffers are called HET AS, HET BS, and HET P.
Following table shows name of analysis requirement as function of gain, subcom state, and buffer.

Gain	Subcom State (Buffer)	HET AS	HET BS	HET P
LG	all	ASZ3	BSZ2	PEN
HG	S1=0 or S2=0	AS	BSp	PEN
HG	S1=S2=1	AS	BSe	PEN

LET 5) Rates and Analysis

LET A is described; LET's B, C, and D are similar.

Name	Accum Number	Subcom State (S1-S4)	Simplified Logic Equation	Description
LAZ3*	R17	all	L1.L2.L3.SL*.L4*	Z<3 of appropriate range, 70 to 520 microns Si nominal.
LAZ3	R18	all	L1.L2.L3.SL.L4*	Z>=3 of appropriate range, 70 to 520 microns Si nominal.
LATHP	R25	6 & 14	L1.L2.L3.L4*	Nuclei of appropriate range, 70 to 520 microns Si nominal.

LAZ3* causes analysis and events are stored in buffer LET SL*.
LAZ3 causes analysis and events are stored in buffer LET SL.

Note that R17 and R18 are subject to modification by the command system; R25 is not.

TET 5) Rates and Analysis

Name	Accum Number	Subcom State (S1-S4)	Simplified Logic Equation	Description
TAN	R28	all	W1.W2.D3.D8*.G*	Electrons of appropriate range. See nominal response curves.
TLO	R29	even (S1=0)	TAN.D5.D6*.UT*	Low energy electrons.
THI	R29	odd (S1=1)	TAN.D6.D7.UT*	High energy electrons.

TAN causes analysis. Events are stored in buffer called TET.

Table C2 - Definition of Symbols Used in Table C1 for HET, LET, and TET

HET TELESCOPE PARAMETERS

Event Type	Type of Analysis	Proton Energy Range (MeV)	Coincidence Condition	Detectors Analyzed	Geometry Factor (cm^2-ster)
S_1	dE/dx vs. E	4- 57	$A_1A_2\bar{C}_4\bar{G}$	$A_1, A_2, C_1+C_2+C_3$	1.0-1.7
S_2	dE/dx vs. E	18- 70	$B_1B_2\bar{C}_1\bar{G}$	$B_1, B_2, C_2+C_3+C_4$	0.9-1.7
P	Triple dE/dx	70-500	$B_1B_2C_1$	$B_1, C_1, C_2+C_3+C_4$	1.7

Table C3 - HET Telescope Parameters

LET TELESCOPE PARAMETERS
(SL = Slant Condition)

Type	Element	Energy Range (MeV/nuc)	Coincidence Condition	Detectors Analyzed	Geometry Factor (cm^2-sr)
S_1	$Z \leq 2$	H:3-8.4	$L1L2L3\bar{L}4\ S\bar{L}$	L1,L2,L3	0.44
S_2	$Z \geq 3$	{ ^{16}O:5.3-17 ; ^{56}Fe:7.4-23 }	$L1L2L3\bar{L}4\ SL$	L1,L2,L3	0.44

Table C4 - LET Telescope Parameters

Word format:

	1 12	13 24	25 36	37 48
HET/LET	TAG WORD	PHA3	PHA2	PHA1
TET	TAG WORD 1	TAG WORD 2	PHA2	PHA1

Table C5 - PHA Word Format

Tag Bits :	1	2	3	4	5	6	7	8	9	10	11	12
HET AS	C1	C2	C3	C4	slant	G2*	G1.G3*	HG	0	0	block	caution
HET BS,PEN	C1	C2	C3	C4	slant	G2*	G1.G3*	HG	0	1	block	caution
LET A/B	slant	L3	L2	LB1	DLA2	DLB3	DLB2	DLA3	1	0	block=0	caution
LET C/D	slant	L3	L2	LD1	DLC2	DLD3	DLD2	DLC3	1	0	block=1	caution
TET (1)	D1L	D1H	D2L	D2H	D3L	D3H	D4L	D4H	1	1	0	caution
TET (2)	GA	GB	SD7/8	AD4L	D5L	D5H	D6L	D6H	D7L	D7H	D8L	GA + GB

Block = 0 for block I, 1 for Block II.

Caution flag = overflow in PHA or high gain/low gain switching in progress.

Table C6 - PHA Tag Word Definition

PHA Readout :

LET and HET

Sum	AS	BS	P	LET
A1 + LA3 + LB3	PHA3			PHA3
C2 + C3 + C4		PHA3	PHA3	
A2 + B2	PHA2	PHA2		
C1 + LA2 + LB2			PHA2	PHA2
C1 + C2 + C3	PHA1			
B1 + LA1 + LB1		PHA1	PHA1	PHA1

TET

D1	PHA1
D2	PHA2

Gain switching in HET is done with S5 after each 480 rate readouts when in AUTO mode.
High gain for S5 = 1

Table C7

Detector Readout During HET-AS, HET-BS, HET-P, LET and TET PHA Events