



PROJETO E CONSTRUÇÃO
DE EQUIPAMENTO DE APOIO E CONTROLE
DE INSTRUMENTOS DE OBSERVAÇÃO ASTRONÔMICA

(μ -COSMOS)

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APRESENTAÇÃO DE PROJETO DE CONCLUSÃO
DO CURSO DE GRADUAÇÃO EM ASTRONOMIA - IGEO/UFRJ

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Jorge de Albuquerque Vieira

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1. Astronomia - Instrumentação - Automação - Microprocessador.

I. IGEO/UFRJ

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1. Astronomia - Instrumentação - Automação -
Microprocessador.

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II. Título

RESUMO

Este trabalho consiste no projeto e construção de um equipamento, baseado em microprocessador, com funções de suporte à observação astronômica em telescópios, radiotelescópios, etc..-

Funções como relógio sideral e civil, calcular um astro de acordo com o nome na constelação ou dado o nome vulgar, e criar um menu de observações, com hora de início, duração e posição de astro, permitem automatizar a operação do instrumento usado na observação.

Funções como atlas que realiza um banco de dados com ascensões e coordenadas e mapa que permite a identificação das coordenadas de um astro qualquer, posicionado no campo de instrumento, são funções de apoio à observação, substituindo confortavelmente o ^{Ao} diário astronômico e servindo até como instrumento de pesquisa.

Dan e Elizabeth

Com uma concepção portátil, este equipamento pode ser utilizado no campo, com toda facilidade, ou mesmo constituir-se na mesa de controle de um grande instrumento. Em qualquer caso, a automatização dos procedimentos de relógio e acompanhamento permite liberar o astrônomo para uma função muito mais importante e agradável: a observação do fenômeno.

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Funções como relógio sideral e civil, calar um astro dando o nome na constelação ou dado o nome vulgar, e criar um menu de observações com hora de início, duração e posição do astro, permitem automatizar a operação do instrumento usado na observação.

Funções como atlas que realiza um banco de dados com astros e coordenadas e mapa que permite a identificação das coordenadas de um astro qualquer, posicionado no campo do instrumento, são funções de apoio à observação, substituindo confortavelmente o anuário astronômico e servindo até como instrumento de pesquisa.

Com uma concepção portátil, este equipamento pode ser utilizado no campo, com toda facilidade, ou mesmo constituir-se na mesa de controle de um grande instrumento. Em qualquer caso, a automatização dos procedimentos de calagem e acompanhamento permite liberar o astrônomo para uma função muito mais importante e agradável: a observação do fenômeno.

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I. INTRODUÇÃO

O desenvolvimento da eletrônica vem permitindo a automa-
tização de um grande número de funções, pelo uso de circui-
tos integrados em larga escala, com capacidade de processa-
mento. São principalmente os microprocessadores que explo-
diram o mercado de aplicações, desde jogos até grandes má-
quinas computadoras.

Com baixo custo e alto grau de compactação, estes cir-
cuitos favorecem a realização de pequenos controladores a-
cessíveis a aplicações amadoras, em todos os setores de tra-
balho.

Particularmente, em astronomia, uma aplicação importan-
te consiste na obtenção de um controlador de instrumentos de
observação para a automatização de todas as funções de posi-
cionamento e acompanhamento do instrumento, assim como fun-
ções relacionadas com equipamentos acessórios do tipo câme-
ras fotográficas, espectômetros e até mesmo a cúpula do ob-
servatório.

Alguns observatórios com instrumentos profissionais de
grande porte já dispõem de mesa de controle com comandos
de natureza elétrica-eletrônica e em alguns casos com capa-
cidade de processamento, não só para o controle dos movimen-
tos dos instrumentos como para o tratamento dos dados cole-
tados.

Agora, com o contínuo barateamento dos circuitos integrados em larga escala, está ao alcance do astrônomo amador a implementação de um equipamento como o mostrado a seguir, que tornará mais confortável a operação de seu instrumento, aumentando sua disponibilidade à observação do céu.

1. Dimensões reduzidas, com boa portabilidade para uso tanto em casa quanto no campo.

2. Alimentação única, com padrão de 11 volts para permitir a alternativa de alimentação com bateria de automóvel.

3. Entrada de dados através de teclado alfanumérico com 1 sets de caracteres:

- letras e números
- letras gregas
- caracteres especiais

4. Saída de dados através de display alfanumérico com set de caracteres idêntico ao teclado e barra de controle para interface com diferentes tipos de motores de instrumento de observação.

5. Conjunto de funções realizadas em tempo real, sob comando do operador:

- TIME: relógio sideral local e civil com precisão de oscilador à quartzo, com acerto de hora, minuto e segundo.

II. CARACTERÍSTICAS GERAIS

Este equipamento foi concebido de modo a configurar-se numa console para controle do instrumento de observação, com as seguintes características:

1. Dimensões reduzidas, com boa portabilidade para uso também no campo.
2. Alimentação única, com padrão de 12 volts para permitir a alternativa de alimentação com bateria de automóvel.
3. Entrada de dados através de teclado alfanumérico com 3 sets de caracteres:
 - letras e números
 - letras gregas
 - caracteres especiais
4. Saída de dados através de display alfanumérico com set de caracteres idêntico ao teclado e barra de controle para interface com diferentes tipos de motores do instrumento de observação.
5. Conjunto de funções realizadas em tempo real, sob comando do operador:
 - TIME: relógio sideral local e civil com precisão de oscilador à quartzo, com acerto de hora, minuto e segundo.

- ATLAS: banco de dados equivalente a um anuário astronômico, implementados por um sistema de módulos de memória como uma library, consultados teclando-se o nome "científico" do astro, ou ainda o nome vulgar; resposta das coordenadas universais do astro aparecendo no display.

- CALAR: posicionamento do instrumento no astro selecionado pelo operador, através da teclagem de nome do astro; as duas coordenadas universais são colocadas automaticamente sendo que a ascensão reta é corrigida pela hora sideral local dando lugar ao ângulo horário.

- MENU : realiza automaticamente uma rotina diária de observação com horários de observação, duração da observação e astro a serem observados; no horário previsto o astro é calado, e ao final do tempo previsto para a observação o instrumento retorna à posição de repouso, onde as tensões mecânicas sejam mínimas; são 25 astros que poderão ser armazenados numa memória tipo "scratch-pad", antes de uma saída para o campo ou em uma aplicação onde os pontos a serem observados não estão contidos nos módulos disponíveis, por se tratar de astros especiais ou centros de regiões que se deseja estudar, observar, fotografar, etc...

III. ARQUITETURA DO EQUIPAMENTO

Este equipamento tem como centro de decisões e controle uma unidade central de processamento (CPU) 8085 de fabricação INTEL, trabalhando a uma velocidade equivalente a 3MHz.

A configuração da memória divide-se em 1K bytes (1024) de memória de dados do tipo volátil (RAM), 2K bytes (2048) de memória de programa (EPROM), 2x256x8 bytes de memória de matriz de caracteres do display (EPROM).

Os integrados do tipo I/O, que servem à entrada e saída de dados, são usados para a interface com o teclado de 32 teclas e o display alfanumérico e para o controle dos motores de calagem.

Outros integrados periféricos são usados como decodificadores para as memórias, latch da barra de dados para atender à multiplexagem com as linhas de endereço, gates para lógica combinacional de seleção, e contador de 14 bits para realização do relógio de tempo real.

O sistema de módulos de library constitue-se de pastilhas de memória do tipo EPROM de 2K bytes, cada qual comportando da ordem de 250 astros, e circuitos isoladores das barras internas ao processador permitindo a troca de módulos durante a operação normal, sem perda do contexto, através de um soquete tipo esforço-zero.

Os drivers do display servem de interface entre o controlador e o display alfanumérico de 16 segmentos.

O diagrama de blocos do circuito e o fluxo de informações entre blocos, estão mostrados na figura 1.

O bloco CPU contém toda a inteligência do equipamento, com um set de instruções bem definido, contém os registros de memória, a unidade aritmética-lógica (ALU), a lógica de interpretação das instruções e correspondentes microprogramas com a sequência de execução.

O bloco LATCH realiza a separação da barra de dados e endereço nas linhas multiplexadas da CPU 8085.

O bloco MEMÓRIA DE PROGRAMA contém os programas em linguagem de máquina que realizam todas as operações do equipamento. Todas as instruções são gravadas neste tipo de memória que é do tipo não volátil, de modo que em caso de desligarmos o equipamento, não são perdidas estas informações.

O bloco MEMÓRIA DE DADOS contém as tabelas dinâmicas, os flags, os registros de dados e o stack usado na manipulação de subrotinas e interrupções. São posições de memória volátil e portanto alteráveis ao longo do processamento.

O bloco MEMÓRIA SCRATCHPAD, TIMER, I/O é realizado por uma única pastilha. A parte de memória é também usada para guardar dados alteráveis e particularmente pode servir à área

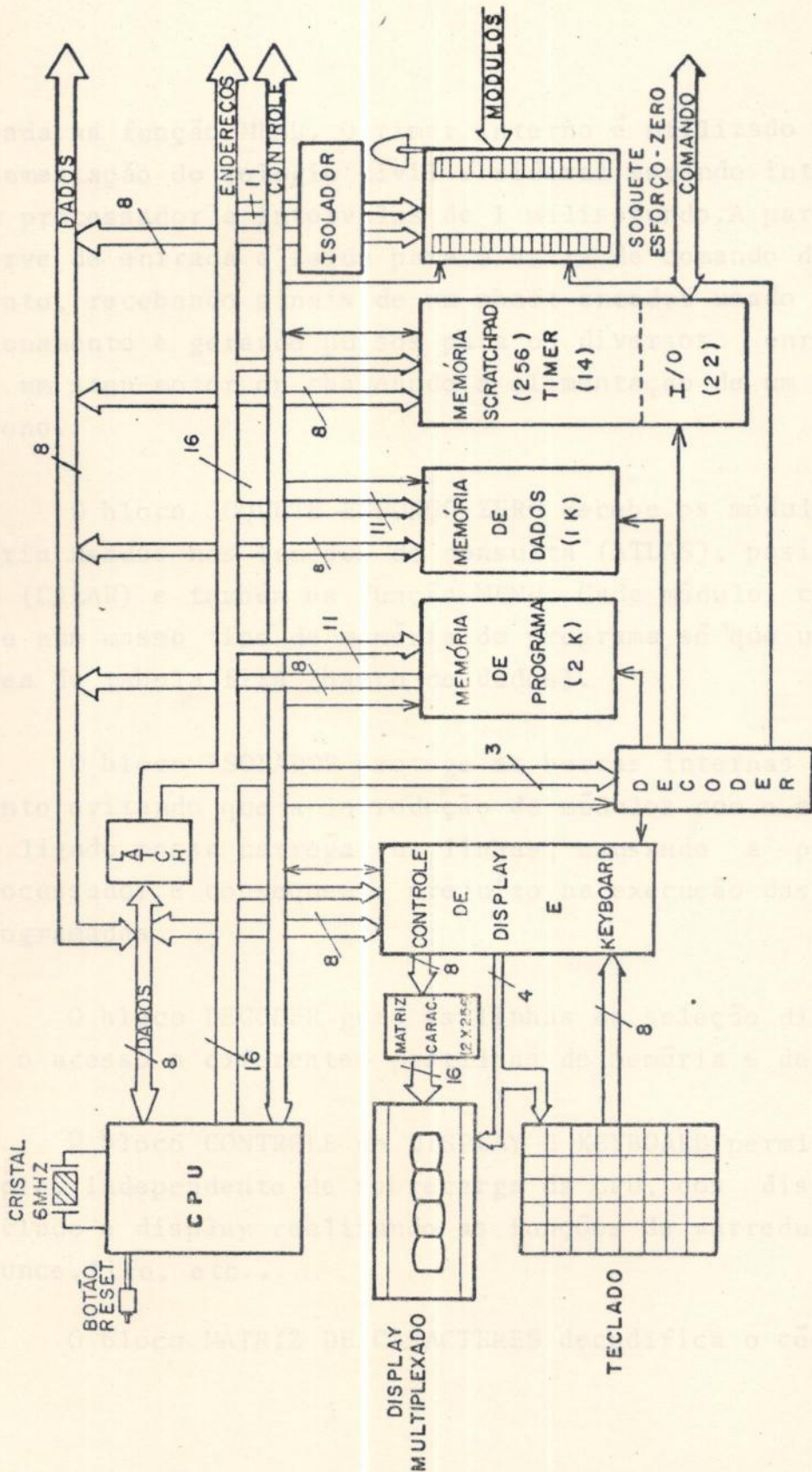


FIG. 1. ARQUITETURA DO CONTROLADOR

usada na função MENU. O timer interno é utilizado para a implementação do relógio civil e sideral gerando interrupções no processador a intervalos de 1 milissegundo. A parte de I/O serve de entrada e saída para a barra de comando do instrumento, recebendo sinais de um shaft-encoder usado no posicionamento e gerando pulsos para os diversos enrolamentos de um step-motor ou chaveando a alimentação de um motor síncrono.

O bloco SOQUETE ESFORÇO-ZERO recebe os módulos de memória usados nas funções de consulta (ATLAS), posicionamento (CALAR) e também na função MENU. Cada módulo constitui-se num mesmo tipo de memória de programa, só que usada como área de tabela fixa (banco de dados).

O bloco ISOLADOR protege as barras internas ao equipamento evitando que a introdução de módulos com o equipamento ligado possa carregar as linhas, causando a perda do processador e conseqüente prejuízo na execução das tarefas programadas.

O bloco DECODER gera as linhas de seleção discriminando o acesso a diferentes pastilhas de memória e de I/O.

O bloco CONTRÔLE de DISPLAY E KEYBOARD permite o controle, independente de sobrecarga da CPU, dos dispositivos teclado e display realizando as funções de varredura, anti-bounce, fifo, etc...

O bloco MATRIZ DE CARACTERES decodifica o código usa-

do na identificação dos caracteres (parte em ASCII) em 16 segmentos necessários ao display. Esta matriz é também constituída de memórias do tipo EPROM e sua decodificação foi de finida de modo a atender ao set de caracteres pretendido para esta aplicação.

O DISPLAY é do tipo alfanumérico do fabricante HP, com posto de 16 segmentos e 2 pontos, com anodos multiplexados (catodo comum), permitindo a implementação de todo o set de caracteres necessários à aplicação.

O TECLADO, é do tipo de calculadora, configurado convenientemente para a aplicação em uma matriz de 4x8 com 3 níveis de funções: superior, central, inferior - associadas a cada tecla.

IV. DESCRIÇÃO DO HARDWARE

Os circuitos envolvidos neste projeto são basicamente componentes LSI (Large Scale Integration) voltados para aplicação em microprocessadores. São máquinas sequenciais e pastilhas periféricas de suporte que configuram um computador com a unidade de processamento central, as memórias, as portas de I/O e os dispositivos de entrada e saída.

O diagrama de interligação entre as diferentes pastilhas e o circuito completo se encontra na figura 2.

Baseando-se no diagrama em blocos da figura 1, podemos relacionar a cada um dos blocos as seguintes pastilhas:

CPU: 8085, XTAL, lógica de reset
LATCH: 74175, INVERSOR
SCRATCHPAD: 8155
DECODER: 8205, NAND
MEM. PROGR: 2716
MEM. DADOS: 2114, lógica de seleção
ISOLADOR: 8216
CONT. DISPLAY: 8279, 8205
MATRIZ CARAC.: 2716
DISPLAY: HDSP 6504, 75491, BC557
TECLADO: TIPO CALCULADORA NOVUS.

Todos os data-sheets destes componentes se encontram no ANEXO II.

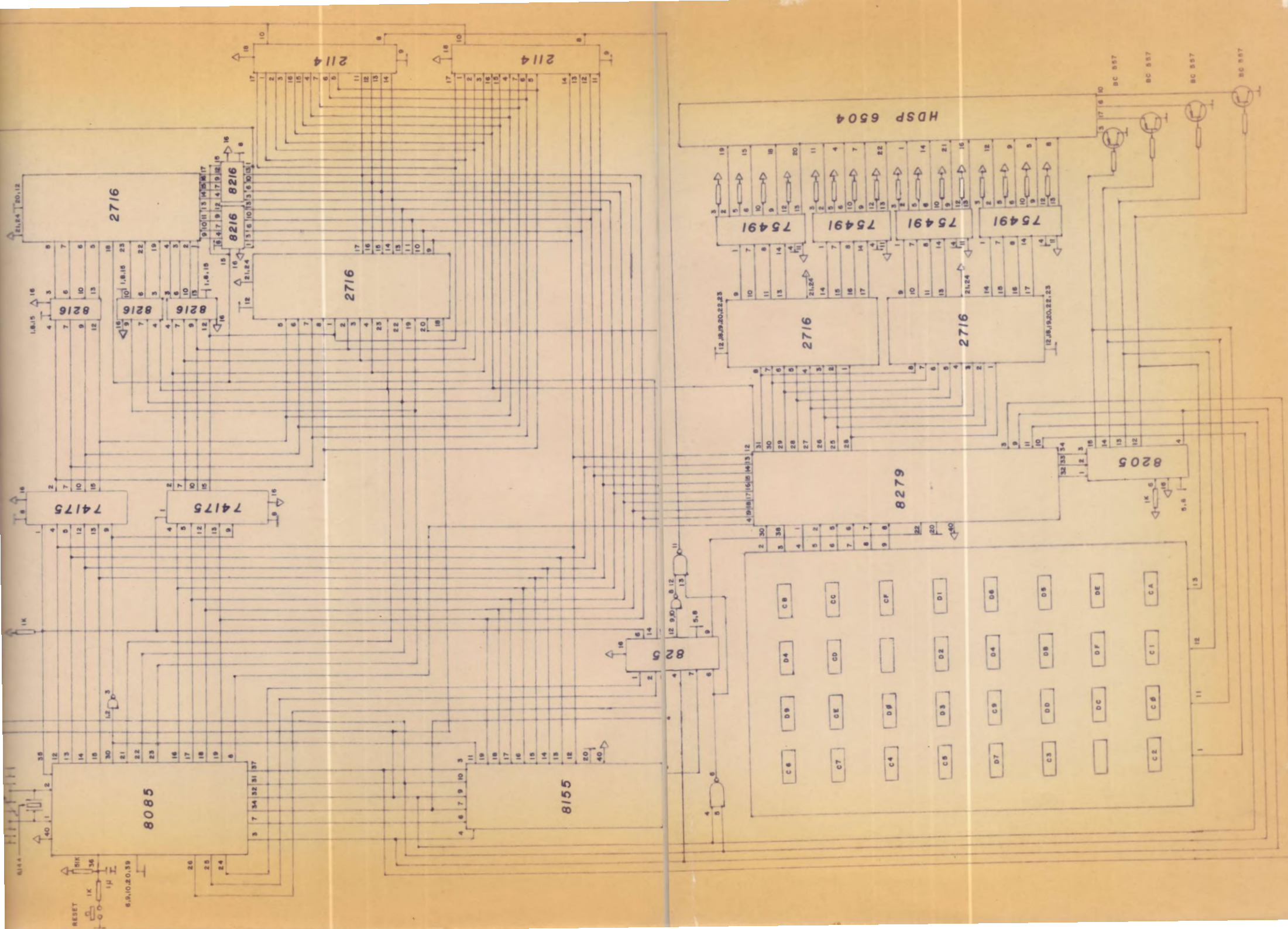


FIG. 2. HARDWARE DO CONTROLADOR

O fluxo da operação deste equipamento começa após o reset da CPU pelo acionamento do botão de reset.

A partir daí a CPU (8085) começará a executar o programa residente em EPROM (2716), iniciando na primeira posição de memória e seguindo instrução à instrução de acordo com a sequência do programa.

Durante a execução dos programas, a CPU poderá ser interrompida pelo relógio de tempo real realizado pelo timer do 8155, ou pelo 8279 quando qualquer tecla for pressionada.

A CPU, tão logo possa, atenderá estas interrupções executando programas específicos que visam a atualização do tempo civil e sideral, e o atendimento a comandos do operador.

As memórias de dados compostas por 2 pastilhas com organização de 1024x4 bits, armazenam os parâmetros alteráveis, como flags, registros de hora, minuto e segundo, etc..

Em função dos comandos do operador, novas rotinas são ativadas realizando as funções descritas no capítulo II.

A pastilha 8279 realiza sôzinha o controle do teclado e do display, fazendo uma varredura sobre as teclas e recebendo a resposta nas linhas de retorno, e multiplexando as linhas comuns do display a uma taxa compatível com a persistência retiniana, visando minimizar consumo e o número de

portas para os segmentos.

São necessárias interfaces para o display que permitam "drive" para os leds de cada segmento e para o retorno de corrente do catodo comum de cada caracter. No primeiro caso foram usados os "drivers" 75491 e no segundo os transistores BC 557.

Outro ponto ainda relacionado ao display diz respeito ao grande número de segmentos deste display alfanumérico / (16+2 pontos) que exigiu intercalar-se entre o 8279 e o display, uma matriz que receberia um endereço de 8 bits e responderia com um dado de 16 bits.

Considerando-se este endereço como o código ASCII de cada caracter, o set de caracteres teria no máximo 128, sendo que o conjunto de letras gregas e outros símbolos especiais poderiam estar distribuídos pelos caracteres de controle, sem utilidade nesta aplicação.

Assim bastariam 2 pastilhas de memória organizadas na forma de 256x8 bits, e que ainda teriam 128 posições vagas. Foram usadas inicialmente 1702 que possuíam esta organização mas necessitavam de duas fontes de alimentação, uma positiva e outra negativa. Como tínhamos a intenção de alimentar o equipamento apenas com 12V, e com um circuito de fonte simples, trocamos para a 2716.

Esta memória apresenta 8 vezes a capacidade da ante-

rior embora custe bem menos e é de fácil aquisição. As sete páginas de 256 bytes restantes poderiam ser usadas para diferentes set de caracteres conforme a língua de origem ou a aplicação específica, bastando para isso, mudar um estape.

Quanto ao comando dos motores e à leitura dos sensores, 22 bits de porta de entrada e saída programáveis estão a disposição de qualquer tipo de instrumento e outros equipamentos acessórios.

Na simulação apresentada são usados:

2 bits de saída para comando dos dois "steppers"

- 1 para o "stepper" de ângulo horário
- 1 para o "stepper" de declinação

8 bits de entrada para os sensores de quadrante dos dois "steppers"

- 4 para o "stepper" de ângulo horário
- 4 para o "stepper" de declinação

O hardware é expansível em termos de memória podendo receber até mais 6K bytes de RAM e/ou EPROM, podendo assim se converter num pequeno sistema de desenvolvimento.

V. DESCRIÇÃO DO SOFTWARE

O conjunto de programas que estão residentes no equipamento constam deste capítulo, assim como aqueles contidos nos módulos disponíveis.

A linguagem assembler, forma mnemônica das instruções em linguagem de máquina, foi usada para o desenvolvimento dos programas, utilizando-se para tal, um sistema de desenvolvimento com capacidade de montagem, debugger e gravação dos programas em linguagem de máquina.

Este conjunto escrito em linguagem assembler do processador 8085, está composto de uma série de rotinas, algumas de inicialização, outras ativadas pelo comando do operador.

O set de instruções do microprocessador 8085 consta do ANEXO I.

Quanto à estrutura dos módulos-library, inicialmente / prevista a utilização de pastilhas de EPROM com 2K bytes de memória, especificamos cada astro com até 4 caracteres alfa numéricos e/ou letras gregas, de acordo com convenções internacionais.

Assim, com as coordenadas associadas a cada astro, na forma BCD, são necessários 8 bytes na caracterização de cada astro:

- 4 bytes ASCII de especificação do astro

- 2 bytes BCD de coordenada ascensão reta
- 2 bytes BCD de coordenada declinação

Isto fixa em 256 o número de astros por pastilha de memória de 2K bytes. Com o uso de pastilhas de 4K ou 8K bytes, esta capacidade pode ser duplicada ou quadruplicada, respectivamente. Considerando-se que estas memórias são de uma mesma família e seguem o mesmo padrão de pinagem, o hardware pode aceitar facilmente as memórias 2732(4Kx8) ou 2764(8Kx8), e neste caso chegaria a armazenar dados de mais de mil astros.

Outro aspecto com relação à codificação das coordenadas do astro diz respeito ao sinal da declinação, ou seja, a sua identificação no hemisfério celeste. Para não se gastar mais um byte de informação, assinala-se na coordenada ascensão reta um bit de sinal, correspondendo à declinação do astro. Assim, graças à disponibilidade no valor máximo da ascensão reta ($23^{\text{h}}59^{\text{m}}$), o bit 7 do byte de hora é setado no caso do astro estar localizado no hemisfério sul.

Quanto ao mapeamento de memória e de I/O temos a seguinte tabela:

DISPOSITIVO	ENDEREÇAMENTO	OBSERVAÇÕES
MEM. ROM	0000 A 07FF	PROGRAMA
MEM. ROM	0800 A 0FFF	MÓDULOS

DISPOSITIVO	ENDEREÇAMENTO	OBSERVAÇÕES
MEM. RAM	1800 A 1BFF	DADOS
MEM. RAM	3800 A 38FF	SCRATCHPAD
MEM. I/O -	3100	CONTROLE 8279
MEM. I/O	3000	DADO 8279
I/O	38	CONTROLE 8155
I/O	39	PORTA A 8155
I/O	3A	PORTA B 8155
I/O	3B	PORTA C 8155
I/O	3C	TIME L 8155
I/O	3D	TIME H 8155

MEM I/O significa posição de entrada e saída mapeada em memória.

Quanto às rotinas de calagem, estas dependerão do tipo de instrumento de observação, da mecânica de acompanhamento, dos motores e sensores usados na calagem rápida. Portanto esta rotina poderá ser adaptada para cada caso, sem restrições.

No nosso caso, os "stepper" são espécies de relés de passo, equivalentes a step-motors de passo pouco preciso, da ordem de centésimo de volta.

Para o "stepper" de ângulo horário, a precisão é de 14,4 minutos, e para o "stepper" da declinação a precisão é de $3^{\circ}36'$. Portanto no processo de calagem, os "stepper" são posicionados no valor igual ou imediatamente superior à coordenada em questão.

De um modo geral, todas as rotinas apresentam toda flexibilidade no tratamento dos comandos do operador, de modo a tornar cômodo, seguro e simples a troca de informações homem-máquina.

** MICRO-COSMOS ** V1.4(12/11/82)11/82 01 SDD-G80/85 META-ASBL V(1)

AMENU	1A26	APAG	01E6	ASCBCD	0117	ATLA	0125
ATLA1	012E	ATLAS	1A06	BCDASC	01CD	BUFFER	1B00
CR155	0038	CR279	3100	CALAR	03DE	COMP	04ED
CONT	1A0D	CONTO	00C7	CONTA	1A11	COORD	1A1C
CPOINT	1A01	CRFIFO	0040	CURSOR	00CA	D8279	3000
DELAY	0243	DENTE	0574	DOLLAR	1A07	DYCLEAR	00CC
DYSP	01D3	ERRO	0780	ERROF	0798	FHD	1A22
FIM	0527	FIMTAB	00F8	FIRST	00CB	FLAGP	1A18
FMENU	1A25	FMENUR	1A28	FSINAL	1A14	FSINALP	1A15
FR155	00C2	ICONT	1A09	INT65	025D	INT75	02C7
ITIMEH	007C	ITIMEL	0000	KBDYM	0000	L1	0268
L10	0224	L100	0044	L1000	009B	L11	0245
L1100	056A	L1200	04A2	L13	0146	L14	0167
L15	0140	L1500	05D3	L1501	05F8	L16	0160
L2	0272	L200	03E7	L201	03F9	L202	03FF
L203	04D2	L300	027C	L30	031B	L300	0595
L301	05AF	L315	0290	L4	01DB	L40	0051
L400	04C0	L44	009E	L42	00B1	L43	00CD
L44	0105	L46	00C5	L47	00E1	L5	02AA
L50	05DF	L500	03AD	L501	0474	L502	0487
L505	0517	L506	051A	L51	0646	L52	060B
L53	0625	L54	0638	L55	05CA	L7	0285
L71	02C2	L8	0215	L800	03A4	L802	05AC
L81	0214	L9	023A	L90	051F	L900	052E
L91	0509	L92	04F1	LA	041E	LAB	045D
LAC	0467	LAD	0490	LAE	0499	LB	0444
L830	0344	LC	0552	LCPPOINT	00D1	LIBRARY	0800
L21	0365	LZ2	0367	LZ3	034B	LZ5	040A
MASK	1A00	MENSAG	1A20	MENU	05B9	MOTORD	038F
PESE	0346	PMENU	1A23	POINT	1A01	PORTA	0039
PORTB	003A	POS	1A17	PREPARA	0182	R1	019A
R2	01B4	REL	1A13	RESET	036E	RESP	1A08
RESPSET	0202	ROTEIR	03B7	ROTEIRF	03DE	SALT01	003F
SCRAT	1AF8	SCRATCH	1A30	SECOND	00CC	SIDECIV	1A12
STACK	1C00	STEPPD	0557	STEPH	0531	SUB3	05DD
SUBCD	0589	TABCONV	07A0	THIGH	003D	THIRD	00CF
TIME	0095	TIME1	FFFF	TIME2	00C1	TIME3	00FF
TIME4	1FFF	TLOW	003C	TSUB	02F3	ZERO	007A

0000 0000 0000

0001 0001 0001

0002 0002 0002

0003 0003 0003

0004 0004 0004

0005 0005 0005

0006 0006 0006

0007 0007 0007

0008 0008 0008

0009 0009 0009

0010 0010 0010

0011 0011 0011

0012 0012 0012

0013 0013 0013

0014 0014 0014

0015 0015 0015

0016 0016 0016

0017 0017 0017

0018 0018 0018

0019 0019 0019


```

1000 000000 0005 STACK EQU 01000
0100 000000 0010 C8279 EQU 03100
0200 000000 0015 D8279 EQU 03000
0300 000000 0020 KBDYM EQU 0
0400 000000 0025 DYCLEAR EQU 0CC
1A00 000000 0030 MASK EQU 01A00
0040 000000 0035 CRFIFO EQU 040
0039 000000 0040 PORTA EQU 039
0008 000000 0045 FIRST EQU 0CB
0000 000000 0050 SECOND EQU 0CC
00CF 000000 0055 THIRD EQU 0CF
07A0 000000 0060 TABCONV EQU 07A0
1A04 000000 0065 POINT EQU 01A01
1A01 000000 0070 CPOINT EQU POINT
00CA 000000 0075 CURSOR EQU 0CA
0004 000000 0080 LCPPOINT EQU L(CPOINT)
1A06 000000 0085 ATLAS EQU 01A06
0800 000000 0090 LIBRARY EQU 0800
1800 000000 0095 BUFFER EQU 01B00
1A07 000000 0100 DOLLAR EQU 01A07
1A08 000000 0105 RESP EQU 01A08
FFFF 000000 0110 TIME1 EQU 0FFFF
0001 000000 0115 TIME2 EQU 1
0000 000000 0120 ITIMEL EQU 0
007C 000000 0125 ITIMEH EQU 07C
0002 000000 0130 I9155 EQU 002
003D 000000 0135 THIGH EQU 03D
003C 000000 0140 TLOW EQU 03C
0007 000000 0145 CONTO EQU 0C7
1A09 000000 0150 ICONT EQU 01A09
1A0D 000000 0155 CONT EQU 01A0D
1A11 000000 0160 CONTA EQU CONT+4
1A12 000000 0165 SIDECIV EQU 01A12
1A13 000000 0170 REL EQU 01A13
0028 000000 0175 C9155 EQU 038
0000 010010 0180 LXI SP,STACK
0003 010021 0185 LXI H,C8279
0006 3E00 0190 MVI A,KBDYM
0008 77 0195 MOV M,A
0009 3ECC 0200 MVI A,DYCLEAR
0008 77 0205 MOV M,A
0000 0D6E03 0210 CALL RESET
000F 32001A 0215 STA MASK
0012 32061A 0220 STA ATLAS
0015 32131A 0225 STA REL
0018 32071A 0230 STA DOLLAR
0018 0DE604 0235 CALL APAG
001E 3E09 0240 MVI A,9
0020 30 0245 SIM
0024 3E08 0250 MVI A,CONTO+1
0023 320D1A 0255 STA CONT
0026 32111A 0260 STA CONTA
0029 3E00 0265 MVI A,ITIMEL
0028 033C 0270 OUT TLOW
002D 3E7C 0275 MVI A,ITIMEH
002F 033D 0280 OUT THIGH
0031 033F00 0285 JMP SALT01
0034 00 0290 ORG 034
0034 035002 0295 JMP INT65
0037 00 0300 ORG 03C

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003C C2C702 0305 . JMP INT75
003F 3EC2 0310 SALT01 MVI A,18155
0044 D329 0315 . OUT C8155
0048 FB 0320 . EI
004A 218703 0325 L100 LXI H,ROTEIR
0047 04DD03 0330 . LXI B,ROTEIRF+1
004A CD0202 0335 . CALL RESPOST
004D AF 0340 . XRA A
004E 32071A 0345 . STA DOLLAR
0051 3A021A 0350 L40 LDA CPOINT+1
0054 FE31 0355 . CPI '1'
0056 CA9500 0360 . JZ TIME
0059 FE32 0365 . CPI '2'
005B CA2501 0370 . JZ ATLA
005E FE33 0375 . CPI '3'
0060 CADE03 0380 . JZ CALAR
0063 FE34 0385 . CPI '4'
0065 CAB905 0390 . JZ MENU
0069 3E01 0395 . MVI A,LCPOINT
006A 32011A 0400 . STA POINT
006D 3A251A 0405 . LDA FMENU
0070 B7 0410 . ORA A
0074 CA7A00 0415 . JZ ZERO
0076 2A261A 0420 . LHLD AMENU
0077 C30A04 0425 L40 JMP LZ5
007A 3A281A 0430 ZERO LDA FMENUR
007D B7 0435 . ORA A
007E CA5100 0440 . JZ L40
0081 AF 0445 . XRA A
0082 32291A 0450 . STA FMENUR
0085 CD9F03 0455 . CALL MOTORD
0088 AF 0460 . XRA A
0089 32171A 0465 . STA POS
008C 32181A 0470 . STA POS+1
008F 32191A 0475 ACCRCD STA POS+2
0092 C35100 0480 . JMP L40
0095 11FFFF 0485 TIME LXI D,TIME1
0098 CD4302 0490 . CALL DELAY
0099 CDE601 0495 L1090 CALL APAG
009E 21021A 0500 L41 LXI H,CPOINT+1
00A1 7E 0505 . MOV A,M
00A2 FE53 0510 . CPI 'S'
00A4 C28100 0515 . JNZ L42
00A7 110E1A 0520 . LXI D,CONTA-3
00AA AF 0525 . XRA A
00AB 32121A 0530 . STA SIDECIV
00AE C3CD00 0535 ATLA JMP L43
00B4 FE43 0540 L42 CPI 'C'
00B3 CAC500 0545 . JZ L46
00B6 3A071A 0550 ATLA LDA DOLLAR
00B9 B7 0555 . ORA A
00BA C24400 0560 . JNZ L100
00BD 3E01 0565 . MVI A,LCPOINT
00BF 32011A 0570 . STA POINT
00C2 C39E00 0575 . JMP L41
00C5 110A1A 0580 L43 LXI D,CONT-3
00C8 3E01 0585 L40 MVI A,1
00CA 32121A 0590 . STA SIDECIV
00CD 1A 0595 L43 LDAX D
00CE CDC001 0600 . CALL BCDASC

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00D1 12      0605      .      INX  D
00D2 1A      0610      .      LDAX D
00D3 CDC001 0615      .      CALL BCDASC
00D6 21021A 0620      .      LXI  H,CPOINT+1
00D9 CDD301 0625      .      CALL DYSF
00DC 3E01      0630      .      MVI  A,L(CPOINT)
00DE 32011A 0635      .      STA  POINT
00E1 3A071A 0640 L47 .      LDA  DOLLAR
00E4 B7        0645      .      ORA  A
00E5 CAE100 0650      .      JZ   L47
00E8 AF        0655      .      XRA  A
00E9 32071A 0660      .      STA  DOLLAR
00EC 3A011A 0665      .      LDA  POINT
00EF D605      0670 L12 .      SUI  LCPOINT+4
00F1 C29800 0675      .      JNZ  L1000
00F4 13        0680      .      INX  D
00F5 12        0685 L11 .      STAX D
00F6 3A121A 0690      .      LDA  SJDECIV
00F9 B7        0695      .      ORA  A
00FA 3EC9      0700      .      MVI  A,CONT0+1
00FC CA9501 0705      .      JZ   L44
00FF 3EC0      0710      .      MVI  A,0C0
0101 D9C2      0715      .      OUT  I8155
0103 3EC9      0720      .      MVI  A,CONT0+1
0105 13        0725 L44 .      INX  D
0106 12        0730      .      STAX D
0107 21021A 0735      .      LXI  H,CPOINT+1
010A 1B        0740      .      DCX  D
010B 1B        0745 PREPARA DCX  D
010C 1B        0750      .      DCX  D
010D CD1701 0755      .      CALL ASCBCD
0110 13        0760      .      INX  D
0111 CD1701 0765      .      CALL ASCBCD
0114 C39800 0770      .      JMP  L1000
0117 7E        0775 ASCBCD MOV  A,M
0118 D630      0780      .      SUI  030
011A 07        0785      .      RLC
011B 07        0790      .      RLC
011C 07        0795      .      RLC
011D 07        0800      .      RLC
011E 23        0805      .      INX  H
011F 96        0810      .      ADD  M
0120 D630      0815 L1 .      SUI  030
0122 12        0820      .      STAX D
0123 23        0825      .      INX  H
0124 C9        0830      .      RETL
0125 11FFFF 0835 ATLA LXI  D,TIME1
0128 CD4302 0840      .      CALL DELAY
012B CDE601 0845      .      CALL APAG
012E 3A071A 0850 ATLA1 LDA  DOLLAR
0131 B7        0855      .      ORA  A
0132 CA2E01 0860      .      JZ   ATLA1
0135 3A011A 0865      .      LDA  POINT
0138 FE01      0870      .      CPI  LCPOINT
013A CA4400 0875      .      JZ   L100
013D 210008 0880      .      LXI  H,LIBRARY
0140 E5        0885 L15 .      PUSH H
0141 01021A 0890 L1 .      LXI  B,CPOINT+1
0144 1604      0895      .      MVI  D,4
0146 06        0900 L13 .      LDAX B

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0147	BE	0905		CMP	M
0148	C26701	0910		JNZ	L14
014B	03	0915		INX	B
014C	23	0920		INX	H
014D	15	0925		DCR	D
014E	C24601	0930		JNZ	L13
0151	CDE601	0935		CALL	APAG
0154	CD9201	0940		CALL	PREPARA
0157	28	0945		DCX	H
0158	44	0950		MOV	B,H
0159	4D	0955		MOV	C,L
015A	24001B	0960		LXI	H,BUFFER
015D	CD0202	0965		CALL	RESPOST
0160	AF	0970	L14	XRA	A
0161	32071A	0975		STA	DOLLAR
0164	C32E01	0980		JMP	ATLA1
0167	E1	0985	L14	POP	H
0168	040800	0990		LXI	B,B
0168	09	0995		DAD	B
016C	7C	1000		MOV	A,H
016D	FE10	1005		CPI	010
016F	C24001	1010		JNZ	L15
0172	AF	1015		XRA	A
0173	32071A	1020		STA	DOLLAR
0176	249007	1025		LXI	H,ERRO
0179	049707	1030		LXI	B,ERROF-1
017C	CD0202	1035		CALL	RESPOST
017F	C26001	1040		JMP	L16
0182	0E00	1045	PREPARA	MVI	C,0
0184	EB	1050		XCHG	
0185	24001B	1055		LXI	H,BUFFER
0188	366A	1060		MVI	M,06A
018A	23	1065		INX	H
018B	3670	1070		MVI	M,070
018D	23	1075		INX	H
018E	363D	1080		MVI	M,7=7
0190	23	1085		INX	H
0191	1A	1090		LDAX	D
0192	FE80	1095		CPI	080
0194	DA9A01	1100		JC	R1
0197	0C	1105		INR	C
0198	E67F	1110		ANI	07F
019A	CD0001	1115	R1	CALL	BCDASC
019D	12	1120		INX	D
019E	1A	1125		LDAX	D
019F	CD0001	1130		CALL	BCDASC
01A2	36FF	1135		MVI	M,0FF
01A4	23	1140		INX	H
01A5	3673	1145		MVI	M,073
01A7	23	1150	RESPOST	INX	H
01A8	363D	1155		MVI	M,7=7
01AA	23	1160		INX	H
01AB	366B	1165		MVI	M,06B
01AD	79	1170		MOV	A,C
01AE	87	1175		ORA	A
01AF	CA9401	1180		JZ	R2
01B2	366D	1185		MVI	M,06D
01B4	23	1190	R2	INX	H
01B5	13	1195		INX	D
01B6	1A	1200		LDAX	D

01B7	CDC001	1205	.	CALL	BCDASC
01BA	13	1210	.	INX	D
01BB	1A	1215	.	LDAX	D
01BC	CDC001	1220	.	CALL	BCDASC
01BF	C9	1225	.	RET	
01C0	47	1230	BCDASC	MOV	B,A
01C1	E4FD	1235	.	ANI	0FO
01C2	07	1240	.	RLC	
01C4	07	1245	.	RLC	
01C5	07	1250	.	RLC	
01C6	07	1255	.	RLC	
01C7	C63D	1260	.	ADI	03D
01C9	77	1265	.	MOV	M,A
01CA	29	1270	.	INX	H
01CB	79	1275	.	MOV	A,B
01CC	E40F	1280	.	ANI	0F
01CE	C63D	1285	.	ADI	03D
01D0	77	1290	.	MOV	M,A
01D1	29	1295	.	INX	H
01D2	C9	1300	.	RET	
01D3	C5	1305	DYSP	PUSH	B
01D4	0E04	1310	DELAY	MVI	C,4
01D6	3E9D	1315	L1	MVI	A,09D
01D8	320031	1320	.	STA	C8279
01DB	7E	1325	L4	MOV	A,M
01DC	32003D	1330	.	STA	D8279
01DF	23	1335	.	INX	H
01E0	0D	1340	.	DCR	C
01E1	C2DB01	1345	.	JNZ	L4
01E4	C1	1350	DELAY	POP	B
01E5	C9	1355	.	RET	
01E6	F5	1360	APAG	PUSH	PSW
01E7	E5	1365	.	PUSH	H
01E9	3E01	1370	.	MVI	A,L(CPOINT)
01EA	32011A	1375	.	STA	POINT
01ED	3EFF	1380	.	MVI	A,OFF
01EF	24021A	1385	.	LXI	H,CPOINT+1
01F2	77	1390	.	MOV	M,A
01F3	29	1395	.	INX	H
01F4	77	1400	.	MOV	M,A
01F5	29	1405	L1	INX	H
01F6	77	1410	.	MOV	M,A
01F7	29	1415	.	INX	H
01F9	77	1420	.	MOV	M,A
01F9	24021A	1425	L2	LXI	H,CPOINT+1
01FC	CDD3D1	1430	.	CALL	DYSP
01FF	E1	1435	.	POP	H
0200	F1	1440	.	POP	PSW
0201	C9	1445	L3	RET	
0202	AF	1450	RESPOST	XRA	A
0203	32071A	1455	.	STA	DOLLAR
0206	3C	1460	.	INR	A
0207	32091A	1465	.	STA	RESP
020A	3E1D	1470	.	MVI	A,01D
020C	320031	1475	.	STA	C8279
020F	3E94	1480	.	MVI	A,094
0211	320031	1485	.	STA	C8279
0214	E5	1490	L81	PUSH	H
0215	7E	1495	L8	MOV	A,M
0216	32003D	1500	.	STA	D8279

0219	14FFFF	4505	.	LXI	D, TIME1
021C	0D4302	4510	.	CALL	DELAY
021F	7C	4515	.	MOV	A, H
0220	88	4520	.	CMP	B
0224	CA3A02	4525	.	JZ	L9
0224	29	4530	L10	INX	H
0225	3A071A	4535	.	LDA	DOLLAR
0228	87	4540	.	ORA	A
0229	CA4502	4545	.	JZ	L8
022C	AF	4550	.	XRA	A
022D	32091A	4555	.	STA	RESPT
0230	3E00	4560	.	MVI	A, KBDYM
0232	320031	4565	L5	STA	C8279
0235	CDE601	4570	.	CALL	APAG
0238	E4	4575	.	POP	H
0239	C9	4580	.	RET	L7
023A	7D	4585	L9	MOV	A, L
023B	B9	4590	.	CMP	C
023C	C22402	4595	L7	JNZ	L10
023F	E4	4600	.	POP	H
0240	C31402	4605	.	JMP	L81
0243	3E01	4610	DELAY	MVI	A, TIME2
0245	30	4615	L11	DCR	A
0246	C24502	4620	L7	JNZ	L11
0249	18	4625	.	DCX	D
024A	7A	4630	.	MOV	A, D
024B	83	4635	.	ORA	E
024C	C24302	4640	.	JNZ	DELAY
024F	C9	4645	INT45	RET	PSW
0250	F5	4650	INT65	PUSH	PSW
0254	C5	4655	.	PUSH	B
0253	E5	4660	.	PUSH	H
0253	34001A	4665	.	LXI	H, MASK
0256	3E40	4670	.	MVI	A, CRFIFO
0258	320031	4675	.	STA	C8279
025B	3A0030	4680	.	LDA	D8279
025E	FECB	4685	.	CPI	FIRST
0260	C26902	4690	.	JNZ	L1 META
0263	36E0	4695	.	MVI	M, 0E0
0265	C98502	4700	.	JMP	L7
0268	FECF	4705	L1	CPI	THIRD
026A	C27202	4710	.	JNZ	L2
026D	3620	4715	.	MVI	M, 020
026F	C98502	4720	.	JMP	L7
0272	FEC0	4725	L2	CPI	SECOND
0274	C27C02	4730	.	JNZ	L3
0277	3600	4735	.	MVI	M, 0
0279	C98502	4740	.	JMP	L7
027C	4F	4745	L3	MOV	C, A
027D	86	4750	.	ADD	M
027E	4F	4755	.	MOV	L, A
027F	2607	4760	INT3	MVI	H, H(TABCONV)
0281	46	4765	.	MOV	B, M
0282	3E64	4770	.	MVI	A, 064
0284	8E	4775	.	CMP	M
0285	C29002	4780	.	JNZ	L31
0288	3E01	4785	.	MVI	A, 1
028A	32071A	4790	.	STA	DOLLAR
028D	C2C202	4795	.	JMP	L71
0290	3A041A	4800	L31	LDA	POINT

0093	4F	1905	.	MOV	L,A
0094	241A	1910	.	MVI	H,H(CPOINT)
0096	79	1915	.	MOV	A,C
0097	FECA	1920	.	CPI	CURSOR
0099	02AA02	1925	.	JNZ	L5
009C	7D	1930	.	MOV	A,L
009D	FE01	1935	.	CPI	L(CPOINT)
009F	CAB502	1940	.	JZ	L7
00A2	70	1945	.	MOV	M,B
00A3	2D	1950	.	DCR	A
00A4	32011A	1955	.	STA	POINT
00A7	03B502	1960	.	JMP	L7
00AA	2C	1965	L5	INR	L
00AB	7D	1970	.	MOV	A,L
00AC	FE03	1975	.	CPI	LCPOINT+5
00AE	CAB502	1980	.	JZ	L7
00B1	32011A	1985	L30	STA	POINT
00B4	70	1990	.	MOV	M,B
00B5	3A091A	1995	L7	LDA	RESP
00B8	B7	1900	.	ORA	A
00B9	02C202	1905	.	JNZ	L71
00BC	24021A	1910	.	LXI	H,CPOINT+1
00BF	0DD301	1915	.	CALL	DYSP
00C2	E4	1920	L71	POP	H
00C3	C1	1925	.	POP	B
00C4	F4	1930	.	POP	PSW
00C5	FB	1935	.	EI	
00C6	C9	1940	.	RET	
00C7	F5	1945	INT75	PUSH	PSW
00C8	C5	1950	.	PUSH	B
00C9	D5	1955	.	PUSH	D
00CA	E5	1960	.	PUSH	H
00CB	240D1A	1965	.	LXI	H,CONT
00CE	3EC81A	1970	.	MVI	A,CONTO+1
00D0	32091A	1975	.	STA	ICONT
00D3	1601	1980	L30	MVI	D,1
00D5	0DF302	1985	.	CALL	TSUB
00D8	24111A	1990	FE09	LXI	H,CONTA
00DB	3A131A	1995	.	LDA	REL
00DE	EE01	2000	L72	XRI	1
00E0	32131A	2005	.	STA	REL
00E3	0607	2010	.	ADI	CONTO
00E5	32091A	2015	.	STA	ICONT
00E8	1600	2020	.	MVI	D,0
00EA	0DF302	2025	.	CALL	TSUB
00ED	E4	2030	.	POP	H
00EE	D4	2035	.	POP	D
00EF	C4	2040	.	POP	B
00F0	F4	2045	.	POP	PSW
00F4	FB	2050	.	EI	
00F2	C9	2055	.	RET	
00F3	35	2060	TSUB	DCR	M
00F4	00	2065	.	RNZ	
00F5	3A091A	2070	.	LDA	ICONT
00F8	77	2075	.	MOV	M,A
00F9	28	2080	.	DCX	H
00FA	7E	2085	L71	MOV	A,M
00FB	0601	2090	.	ADI	1
00FD	27	2095	L72	DAA	
00FE	FE60	2100	.	CPI	060

0200	C24403	2405	.	JNZ	LB30
0203	3600	2410	.	MVI	M,0
0205	2800	2415	.	DCX	H,1
0206	7E00	2420	.	MOV	A,M
0207	C60100	2425	.	ADI	1,0
0209	27	2430	.	DAA	
020A	FE60	2435	.	CPI	060
020C	C24803	2440	.	JNZ	L30
020F	3600	2445	.	MVI	M,0
0211	2800	2450	.	DCX	H,1
0212	7E00	2455	.	MOV	A,M
0213	30001A	2460	.	INR	A,SCRATCH
0214	2700	2465	.	DAA	
0215	FE24	2470	.	CPI	024
0217	C24803	2475	NOFORN	JNZ	L30
021A	AF001A	2480	.	XRA	A
021B	7200	2485	L30-	MOV	M,A
021C	7A0000	2490	.	MOV	A,D
021D	9700	2495	.	ORA	A,1
021E	C8001A	2500	.	RZ	
021F	24301A	2505	.	LXI	H,SCRATCH
0222	CD4603	2510	.	CALL	PESQ
0225	7A	2515	.	MOV	A,D
0226	32251A	2520	L30-	STA	FMENU
0229	24321A	2525	.	LXI	H,SCRATCH+2
022C	3A231A	2530	.	LDA	PMENU
022F	C60200	2535	.	ADI	2,0
0231	32231A	2540	L30-	STA	PMENU
0234	CD4603	2545	.	CALL	PESQ
0237	3A231A	2550	.	LDA	PMENU
023A	D60200	2555	.	SUI	2,0
023C	32231A	2560	.	STA	PMENU
023F	7A	2565	NOFORN	MOV	A,D-07A,06D,'COSMOS',0AA
0240	32231A	2570	.	STA	FMENUR
0243	C9	2575	.	RET	
0244	77	2580	LB30	MOV	M,A
0245	C9	2585	.	RET	
0246	040A1A	2590	PESQ	LXI	B,CONT-3
0249	1600	2595	.	MVI	D,0
024B	3A231A	2600	LZ3-	LDA	PMENU
024E	8D	2605	.	CMP	L
024F	C8	2610	.	RZ	
0250	0A	2615	.	LDAX	B,04E+1',06D,'07A05+2',06D
0251	8E	2620	.	CMP	M
0252	C26703	2625	.	JNZ	LZ2
0255	03	2630	.	INX	B
0256	23	2635	.	INX	H
0257	0A	2640	.	LDAX	B
0259	8E	2645	.	CMP	M
0259	C26503	2650	.	JNZ	LZ1
025C	1601	2655	.	MVI	D,1
025E	23	2660	.	INX	H
025F	23	2665	.	INX	H
0260	23	2670	.	INX	H
0261	23261A	2675	.	SHLD	AMENU
0264	C9	2680	.	RET	
0265	28	2685	LZ1-	DCX	H
0266	0B	2690	.	DCX	B,04E+3',06D,'07A05+4'
0267	440900	2695	LZ3	LXI	D,8
026A	19	2400	.	DAD	D


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0348 034803 2405 . JMP LZ3
034E 3E02 2410 RESET MVI A,2
0370 D239 2415 . OUT C8155
0372 CDE404 2420 . CALL APAG
0375 CD8F03 2425 . CALL MOTORO
0378 AF 2430 . XRA A
0379 32171A 2435 . STA POS
037C 32191A 2440 . STA POS+1
037F 32191A 2445 . STA POS+2
0390 32251A 2450 . STA FMENU
0395 32291A 2455 . STA FMENUR
0398 24301A 2460 ROTEIR LXI H,SCRATCH
039B 32231A 2465 CALAR SHLD PMENU
039E C9 2470 . RET
039F 3E04 2475 MOTORO MVI A,1
0394 32221A 2480 . STA FHD
0394 0401 2485 . MVI B,1
0396 CDA403 2490 . CALL L800
0399 3E02 2495 . MVI A,2
039B 32221A 2500 . STA FHD
039E 0410 2505 . MVI B,010
03A0 CDA403 2510 . CALL L800
03A3 C9 2515 . RET
03A4 CD7405 2520 L800 CALL DENTE
03A7 DB39 2525 . IN PORTA
03A9 AD 2530 . ANA B
03AA CAA403 2535 . JZ L800
03AD CD7405 2540 L500 CALL DENTE
03B0 DB39 2545 . IN PORTA
03B2 AD 2550 . ANA B
03B3 C2AD03 2555 . JNZ L500
03B4 C9 2560 . RET
03B7 6A 2565 ROTEIR DEF 06A,07A,06D,'COSMOS',06A
03B8 7A
03B9 6D
03BA 43
03BB 4F
03BC 53
03BD 4D 2403 ERROR EQU *
03BE 4F 2405 EQU 07A0
03BF 53 2410 DEF OFF,OFF,OFF,'0714',OFF,060
03C0 6A
03C1 54 2570 DEF 'TIME=1',060,'ATLAS=2',060
03C2 49
03C3 4D
03C4 45
03C5 3D
03C6 24
03C7 60
03C8 44
03C9 54 2515 DEF OFF,OFF,OFF,'45',OFF,'0-'
03CA 4C
03CB 44
03CC 53
03CD 3D
03CE 32
03CF 60
03D0 42 2575 DEF 'CALAR=3',060,'MENU=4'
03D1 44 2570 DEF OFF,'02',060,OFF,OFF,OFF
03D2 4C

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03D3	44				
03D4	52				
03D5	3D				
03D6	32				
03D7	6D				
03D8	4D	2425	DEF	07',06A,06C,06D,07',OFF,OFF	
03D9	45				
03DA	4E				
03DB	55				
03DC	3D				
03DD	34				
03DE	FF	2580	ROTEIRF	EQU	*
03DE		2585	GALAR	EQU	*00
03DE	55	2590		ORG	0780,0781,OFF,07',OFF,OFF
0780	6A	2595	ERRO	DEF	06A,'ASTRO NAO ESTA NO ATLAS'
0781	44				
0782	53				
0783	54				
0784	52				
0785	4F				
0786	2D				
0787	4E				
0788	44				
0789	4F				
078A	2D				
078B	45	2340	DEF	OFF,OFF,OFF,'BLKJCTN',OFF	
078C	53				
078D	54				
078E	44				
078F	2D				
0790	4E				
0791	4F				
0792	2D				
0793	44				
0794	54				
0795	4C				
0796	44				
0797	53				
0798	42	2600	ERROF	EQU	*00,0000
0798	4F	2605		ORG	07A0
07A0	FF	2610		DEF	OFF,OFF,OFF,'<7914',OFF,06D
07A1	FF				
07A2	FF				
07A3	3C				
07A4	37				
07A5	39	2420	ORG	07E0	
07A6	34	2425	DEF	07',06C,07',09D,07A,07B,07D	
07A7	34				
07A8	FF				
07A9	4D				
07AA	FF	2615	DEF	OFF,OFF,OFF,'65',OFF,'8='	
07AB	FF				
07AC	FF				
07AD	26	2420	DEF	073,OFF,073,OFF,OFF,OFF,07D	
07AE	35				
07AF	FF				
07B0	39				
07B1	3D				
07B2	FF	2620	DEF	OFF,'03',064,06F,06B,OFF	
07B3	3D				

07B4	33	2625	DEF	'2',06A,065,060,'>',OFF,OFF
07B5	34			
07B6	3F			
07B7	4B			
07B9	FF			
07B9	32	2625	DEF	'2',06A,065,060,'>',OFF,OFF
07BA	4A			
07BB	45	2670	DEF	'2',OFF,OFF,OFF,OFF,OFF,OFF
07BC	40			
07BD	3E			
07BE	FF			
07BF	FF			
07C0	7E	2630	ORG	07C0
07C0	59	2635	DEF	'YZX06IAD',OFF,'N',OFF,OFF
07C1	5A	2670	DEF	'064,061,OFF,OFF
07C2	58			
07C3	51			
07C4	47			
07C5	49	2680	FSTRAL	EQ0 D1A1A
07C6	41	2685	FSTRALP	EQ0 D1A1B
07C7	44	2690	FLOOP	EQ0 D1A1C
07C8	FF	2695	POS	EQ0 D1A1D
07C9	4E	2700	DYORD	EQ0 D1A1E
07CA	FF	2705	MONDAG	EQ0 D1A1F
07CB	FF	2710	FRD	EQ0 D1A1G
07CC	FF	2640	TAME3	DEF OFF,'FE',OFF,'HLKJCTPM',OFF
07CD	46	2720	TAME4	EQ0 D1A1H
07CE	45	2725	FOURTH	EQ0 D3A
07CF	FF	2730	SCRATCH	EQ0 D1A3E
07D0	48	2735	FRENH	EQ0 D1A3F
07D1	4C	2740	FRENH	EQ0 D1A3G
07D2	4B	2745	FRENH	EQ0 D1A3H
07D3	4A	2750	FRENH	EQ0 D1A3I
07D4	43	2755	FURAY	EQ0 SCRATCH+200
07D5	54	2760	FINTAW	EQ0 L(CSCRAT)
07D6	50	2765		ORG CALAM
07D7	4D	2770		LXI D-TYPE1
07D8	FF	2775		CALL DELAY
07D9	42	2645		DEF 'BOSURWU'
07DA	4F	2780	L200	LDA DOLLAR
07DB	53	2785		ORA R
07DC	55	2790		JZ L200
07DD	52	2800		LDA PDIM
07DE	57	2805		CFI LCPPOINT
07DF	56	2810		JZ L200
07E0	3D	2650	ORG	07E0 RAKY
07E0	3F	2655	DEF	'?',06C,'0',080,076,078,070
07E1	40	2815	LXI	D,COUNT+1
07E2	40	2820	MVI	R,6
07E3	90	2825	LDA	R
07E4	76	2830	CFP	R
07E5	78	2835	JNZ	L200
07E6	70	2840	TRX	R
07E7	73	2660	DEF	073,OFF,07D,OFF,OFF,OFF,075
07E8	FF	2845	DCP	D
07E9	7D	2850	JNZ	L200
07EA	FF	2855	SHLD	RENS
07EB	FF	2860	XRA	R
07EC	FF	2865	STB	FSTRAL
07ED	75	2870	LXI	D,COUNT

07EE	74	2665		DEF	074,0FF,077,07B,07A,079,072
07EF	75	2665		AND	D
07F0	76	2665		JR	L
07F1	77	2665		RLC	
07F2	78	2665		STA	FSINAL
07F3	79	2665		MOV	B,P
07F4	7A	2665		AND	07F
07F5	7B	2670		DEF	083,07F,07C,0FF,071,07E,082
07F6	7C	2670		INX	D
07F7	7D	2670		INX	H
07F8	7E	2670		MOV	B,P
07F9	7F	2670		STAX	D
07FA	80	2670		INX	D
07FB	81	2670		INX	H
07FC	82	2675		DEF	084,081,0FF,085
07FD	83	2675		STAX	D
07FE	84	2675		INX	D
07FF	85	2675		INX	H
1A14	86	2680	FSINAL	EQU	01A14
1A15	87	2685	FSINALP	EQU	01A15
1A16	88	2690	FLAGP	EQU	01A16
1A17	89	2695	POS	EQU	01A17
1A1C	90	2700	COORD	EQU	01A1C
1A20	91	2705	MENSAG	EQU	01A20
1A22	92	2710	FHD	EQU	01A22
00FF	93	2715	TIME3	EQU	0FF
1FFF	94	2720	TIME4	EQU	01FFF
003A	95	2725	PORTB	EQU	03A
1A30	96	2730	SCRATCH	EQU	01A30
1A23	97	2735	PMENU	EQU	01A23
1A25	98	2740	FMENU	EQU	01A25
1A26	99	2745	AMENU	EQU	01A26
1A28	9A	2750	FMENUR	EQU	01A28
1AF9	9B	2755	SCRAT	EQU	SCRATCH+200
00F9	9C	2760	FINTAB	EQU	L(SCRAT)
0800	9D	2765		ORG	CALAR
03DE	9E	2770		LXI	D,TIME1
03E1	9F	2775		CALL	DELAY
03E4	A0	2780		CALL	APAG
03E7	A1	2785	L200	LDA	DOLLAR
03EA	A2	2790		ORA	A
03EB	A3	2795	L200	JZ	L200
03EE	A4	2800		LDA	POINT
03F1	A5	2805		CPI	LCPOINT
03F3	A6	2810		JZ	L100
03F6	A7	2815	L200	LXI	H,LIBRARY
03F9	A8	2820	L201	PUSH	H
03FA	A9	2825		LXI	B,CPOINT+1
03FD	AA	2830		MVI	D,4
03FF	AB	2835	L202	LDAX	B
0400	AC	2840	L201	CMP	M
0401	AD	2845		JNZ	L203
0404	AE	2850		INX	B
0405	AF	2855		INX	H
0406	B0	2860		DCR	D
0407	B1	2865		JNZ	L202
040A	B2	2870	L25	SHLD	MENSAG
040D	B3	2875		XRA	A
040E	B4	2880		STA	FSINAL
0411	B5	2885		LXI	D,COORD

0414	7E	2890		MOV	A,M
0415	E680	2895		ANI	080
0417	CA1E04	2900		JZ	LAB
041A	07	2905		RLC	
041B	32141A	2910		STA	FSINAL
041E	7E	2915	LA	MOV	A,M
041F	E67F	2920		ANI	07F
0421	12	2925		STAX	D
0422	13	2930	LAD	INX	D
0423	23	2935		INX	H
0424	7E	2940		MOV	A,M
0425	12	2945		STAX	D
0426	13	2950	LAD	INX	D
0427	23	2955		INX	H
0428	7E	2960		MOV	A,M
0429	12	2965		STAX	D
042A	13	2970	L1:00	INX	D
042B	23	2975		INX	H
042C	7E	2980		MOV	A,M
042D	12	2985		STAX	D
042E	21401A	2990		LXI	H,COORD+1
0431	010F1A	2995		LXI	B,CONTA-2
0434	CD9905	3000		CALL	SUBCD
0437	14471A	3005		LXI	D,POS
043A	1A	3010		LDAX	D
043B	E680	3015		ANI	080
043D	CA4404	3020		JZ	LB
0440	07	3025		RLC	
0441	32151A	3030		STA	FSINALP
0444	1A	3035	LB	LDAX	D
0445	E67F	3040	L1:00	ANI	07F
0447	12	3045		STAX	D
0449	E8	3050		XCHG	
0449	3E01	3055		MVI	A,1
044B	32221A	3060		STA	FHD
044E	CD8D04	3065		CALL	COMP
0451	3E02	3070		MVI	A,2
0453	32221A	3075		STA	FHD
0456	3A141A	3080	L2:03	LDA	FSINAL
0459	B7	3085		ORA	A
045A	CA7404	3090		JZ	L501
045D	CD7405	3095	LAB	CALL	DENTE
0460	DB39	3100		IN	PORTA
0462	E610	3105		ANI	010
0464	CA5D04	3110		JZ	LAB
0467	CD7405	3115	LAC	CALL	DENTER
046A	DB39	3120		IN	PORTA
046C	E610	3125		ANI	010
046E	C26704	3130		JNZ	LAC
0471	C3A204	3135		JMP	L1200
0474	1600	3140	L501	MVI	D,0
0476	211F1A	3145		LXI	H,COORD+3
0479	3E99	3150	L93	MVI	A,099
047B	96	3155		SUB	M
047C	C661	3160		ADI	061
047E	27	3165		DAA	
047F	FE60	3170		CPI	060
0481	C28704	3175		JNZ	L502
0484	1601	3180		MVI	D,1
0486	AD	3185		XRA	A

0487	77	3190	L502	MOV	M,A
0488	2B	3195	.	DCX	H
0489	3E99	3200	.	MVI	A,0B9
048B	82	3205	.	ADD	D
048C	27	3210	.	DAA	
048D	96	3215	.	SUB	M
048E	27	3220	.	DAA	
048F	77	3225	.	MOV	M,A
0490	CD7405	3230	LAD	CALL	DENTE
0493	DB39	3235	.	IN	PORTA
0495	07	3240	.	RLC	
0496	D29004	3245	.	JNC	LAD
0499	CD7405	3250	LAE	CALL	DENTE
049C	DB39	3255	L203	IN	PORTA
049E	07	3260	L206	RLC	
049F	DA9904	3265	.	JC	LAE
04A2	244B4A	3270	L1200	LXI	H,POS+4
04A5	3600	3275	L207	MVI	M,0
04A7	2B	3280	.	DCX	H
04A8	3600	3285	.	MVI	M,0
04AA	144E4A	3290	L121	LXI	D,COORD+2
04AD	CD8D04	3295	.	CALL	COMP
04B0	2A2D4A	3300	.	LHLD	MENSAG
04B3	CD8D04	3305	L208	CALL	PREPARA
04B6	2B	3310	.	DCX	H
04B7	44	3315	.	MOV	B,H
04B8	4D	3320	L209	MOV	C,L
04B9	24001B	3325	.	LXI	H,BUFFER
04BC	CD8D02	3330	.	CALL	RESPOST
04BF	E1	3335	.	POP	H
04C0	AF	3340	L400	XRA	A
04C1	32071A	3345	.	STA	DOLLAR
04C4	3A351A	3350	.	LDA	FMENU
04C7	B7	3355	.	ORA	A
04C8	CAE703	3360	.	JZ	L200
04CB	AF	3365	.	XRA	A
04CC	32251A	3370	.	STA	FMENU
04CF	C35400	3375	.	JMP	L40
04D2	E1	3380	L203	POP	H
04D3	040900	3385	.	LXI	B,03
04D6	09	3390	.	DAD	B
04D7	7C	3395	.	MOV	A,H
04D8	FE40	3400	.	CPI	010
04DA	C2F903	3405	.	JNZ	L201
04DD	AF	3410	.	XRA	A
04DE	32071A	3415	.	STA	DOLLAR
04E1	249007	3420	.	LXI	H,ERRO
04E4	049707	3425	L211	LXI	B,ERROF-1
04E7	CD8D02	3430	.	CALL	RESPOST
04EA	C3C004	3435	.	JMP	L400
04ED	AF	3440	COMP	XRA	A
04EE	32161A	3445	.	STA	FLAGP
04F1	E5	3450	L93	PUSH	H
04F2	D5	3455	.	PUSH	D
04F3	46	3460	.	MOV	B,M
04F4	23	3465	.	INX	H
04F5	4E	3470	.	MOV	C,M
04F6	1A	3475	.	LDAX	D
04F7	67	3480	.	MOV	H,A
04F8	12	3485	.	INX	D

04F9	1A	3490		LDAX	D
04FA	6F	3495		MOV	L,A
04FB	08	3500		DSUB	
04FC	CA2705	3505		JZ	FIM
04FF	D21F05	3510		JNC	L90
0502	3A141A	3515		LDA	FLAGP
0505	87	3520		ORA	A
0506	C22E05	3525		JNZ	L900
0509	3A221A	3530	L91	LDA	FHD
050C	FE01	3535		CPI	1
050E	CA1705	3540		JZ	L505
0511	CD5705	3545		CALL	STEPD
0514	C31A05	3550		JMP	L506
0517	CD3105	3555	L505	CALL	STEPH
051A	D1	3560	L506	POP	D
051B	E1	3565		POP	H
051C	C3F104	3570		JMP	L92
051F	3E01	3575	L90	MVI	A,1
0521	32141A	3580		STA	FLAGP
0524	C30905	3585		JMP	L91
0527	3A191A	3590	FIM	LDA	POS+2
052A	87	3595		ORA	A
052B	C20905	3600		JNZ	L91
052E	D1	3605	L900	POP	D
052F	E1	3610	L900	POP	H
0530	C9	3615		RET	
0531	21191A	3620	STEPH	LXI	H,POS+2
0534	7E	3625		MOV	A,M
0535	C640	3630		ADI	040
0537	27	3635		DAA	
0538	77	3640		MOV	M,A
0539	2B	3645		DCX	H
053A	7E	3650		MOV	A,M
053B	CE14	3655		ACI	014
053D	27	3660		DAA	
053E	FE60	3665		CPI	060
0540	DA5205	3670		JC	LC
0543	C640	3675		ADI	040
0545	27	3680		DAA	
0546	77	3685		MOV	M,A
0547	2B	3690	L802	DCX	H
0548	7E	3695		MOV	A,M
0549	C601	3700	L801	ADI	1
054B	27	3705		DAA	
054C	FE24	3710		CPI	024
054E	C25205	3715		JNZ	LC
0551	AF	3720		XRA	A
0552	77	3725	LC	MOV	M,A
0553	CD7405	3730		CALL	DENTE
0556	C9	3735		RET	
0557	1602	3740	STEPD	MVI	D,3
0559	211B1A	3745		LXI	H,POS+4
055C	7E	3750		MOV	A,M
055D	C626	3755		ADI	036
055F	27	3760		DAA	
0560	FE60	3765		CPI	060
0562	DA6A05	3770		JC	L1100
0565	1604	3775	L803	MVI	D,4
0567	C640	3780		ADI	040
0569	27	3785		DAA	

054A	77	3790	L1100	MOV	M,A
054B	28	3795	L1100	DCX	H
054C	7E	3800	.	MOV	A,M
054D	92	3805	.	ADD	D,MENU
054E	27	3810	.	DAA	L100
054F	77	3815	L1100	MOV	M,A
0570	0D7405	3820	L110	CALL	DENTE
0573	C9	3825	.	RET	.
0574	2A221A	3830	DENTE	LDA	FHD
0577	D93A	3835	.	OUT	PORTB
0579	11FF00	3840	.	LXI	D,TIME3
057C	0D4302	3845	.	CALL	DELAY
057F	AF	3850	.	XRA	A
0580	D93A	3855	.	OUT	PORTB
0582	11FF1F	3860	.	LXI	D,TIME4
0585	0D4302	3865	.	CALL	DELAY
0588	C9	3870	.	RET	L1500
0589	1600	3875	SUBCD	MVI	D,0
058B	0A	3880	.	LDAX	B
058C	BE	3885	.	CMP	M,SUBCD
058D	D29505	3890	.	JNC	L300
0590	1699	3895	.	MVI	D,099
0592	C660	3900	.	ADI	060
0594	27	3905	.	DAA	.
0595	5F	3910	L300	MOV	E,A
0596	3E99	3915	.	MVI	A,099
0598	96	3920	L53	SUB	M,H
0599	C601	3925	.	ADI	15
059B	93	3930	.	ADD	E
059C	27	3935	.	DAA	C,080
059D	77	3940	.	MOV	M,A
059E	28	3945	L54	DCX	H
059F	0B	3950	.	DCX	B
05A0	0A	3955	.	LDAX	B
05A1	92	3960	.	ADD	D,LCPPOINT
05A2	27	3965	.	DAA	POINT
05A3	FE99	3970	.	CPI	099
05A5	CAAC05	3975	L53	JZ	L802
05A8	BE	3980	.	CMP	M,DOLLAR
05A9	D2AF05	3985	.	JNC	L301
05AC	C624	3990	L992	ADI	024
05AE	27	3995	.	DAA	APAG
05AF	5F	4000	L301	MOV	E,A
05B0	3E99	4005	.	MVI	A,099
05B2	96	4010	.	SUB	M,CPOINT+1
05B3	C601	4015	L53	ADI	10LLAR
05B5	93	4020	.	ADD	E
05B6	27	4025	.	DAA	L54
05B7	77	4030	.	MOV	M,A
05B8	C9	4035	.	RET	DOLLAR
05B9	11FFFF	4040	MENU	LXI	D,TIME1
05BC	0D4302	4045	.	CALL	DELAY
05BF	0DE601	4050	.	CALL	APAG
05C2	2A231A	4055	.	LHLD	PMENU
05C5	54	4060	.	MOV	D,H
05C6	5D	4065	.	MOV	E,L
05C7	24021A	4070	.	LXI	H,CPOINT+1
05CA	0D5D05	4075	L55	CALL	SUB3
05CD	7B	4080	.	MOV	A,E
05CE	FEFB	4085	.	CPI	FIMTAB

05D0	DACA05	4090	.	JC	L55
05D3	210000	4095	L1500	LXI	H,0
05D4	19	4100	.	DAD	D
05D7	32231A	4105	.	SHLD	PMENU
05DA	C24400	4110	.	JMP	L100
05DD	0402	4115	SUB3	MVI	B,2
05DF	3A071A	4120	L50	LDA	DOLLAR
05E2	87	4125	.	ORA	A
05E3	CADF05	4130	.	JZ	L50
05E6	AF	4135	.	XRA	A
05E7	32071A	4140	.	STA	DOLLAR
05EA	79	4145	.	MOV	A,B
05EB	FE02	4150	.	CPI	2
05ED	C2F905	4155	.	JNZ	L1501
05F0	3A011A	4160	.	LDA	POINT
05F3	FE01	4165	.	CPI	LCPOINT
05F5	CAD905	4170	.	JZ	L1500
05F8	CD1701	4175	L1501	CALL	ASCBCD
05FB	13	4180	.	INX	D
05FC	CD1701	4185	.	CALL	ASCBCD
05FF	CDE601	4190	.	CALL	APAG
0402	21021A	4195	.	LXI	H,CPOINT+1
0405	13	4200	.	INX	D
0406	05	4205	.	DCR	B
0407	C2DF05	4210	.	JNZ	L50
040A	D5	4215	.	PUSH	D
040B	7E	4220	L52	MOV	A,M
040C	FE53	4225	.	CPI	'S'
040E	C21404	4230	.	JNZ	L51
0411	0E90	4235	.	MVI	C,080
0413	C32504	4240	.	JMP	L53
0414	FE4E	4245	L51	CPI	'N'
0418	0E00	4250	.	MVI	C,0
041A	CA2504	4255	.	JZ	L53
041D	3E01	4260	.	MVI	A,LCPOINT
041F	32011A	4265	.	STA	POINT
0422	C30B04	4270	.	JMP	L52
0425	AF	4275	L53	XRA	A
0426	32071A	4280	.	STA	DOLLAR
0429	11FFFF	4285	.	LXI	D,TIME1
042C	CD4302	4290	.	CALL	DELAY
042F	CDE601	4295	.	CALL	APAG
0432	0402	4300	.	MVI	B,2
0434	D1	4305	.	POP	D
0435	21021A	4310	.	LXI	H,CPOINT+1
0438	3A071A	4315	L54	LDA	DOLLAR
043B	87	4320	.	ORA	A
043C	CA3904	4325	.	JZ	L54
043F	AF	4330	.	XRA	A
0440	32071A	4335	.	STA	DOLLAR
0443	CD1701	4340	.	CALL	ASCBCD
0444	1A	4345	.	LDAX	D
0447	81	4350	.	ADD	C
0448	12	4355	.	STAX	D
0449	13	4360	.	INX	D
044A	CD1701	4365	.	CALL	ASCBCD
044D	CDE601	4370	.	CALL	APAG
0450	21021A	4375	.	LXI	H,CPOINT+1
0453	13	4380	.	INX	D
0454	0E00	4385	.	MVI	C,0

0456 05 4390 DCR B
 0457 022904 4395 JNZ L54
 045A C9 4400 RET
 045B 4405 END *

0004 04
 0005 07
 0006 08
 0007 08
 0008 11
 0009 12
 000A 03
 000B 03
 000C 03
 000D 03
 000E 03
 000F 02
 0010 10
 0011 11
 0012 12
 0013 13
 0014 08
 0015 17
 0016 24
 0017 32
 0018 7F
 0019 14
 001A 5E
 001B 64
 001C 00
 001D 08
 001E 17
 001F 31
 0020 74
 0021 58
 0022 59
 0023 10
 0024 80
 0025 24
 0026 77
 0027 04
 0028 7E
 0029 14
 002A 4E
 002B 14
 002C 00
 002D 35
 002E 37
 002F 34
 0030 75
 0031 42
 0032 44
 0033 53
 0034 50
 0035 35
 0036 52
 0037 43
 0038 74
 0039 44
 003A 00
 003B 00

0010

DEF 071, 'CAS', 0, 6, 009, 2

0015

DEF 080, 'AND', 0, 0, 17, 037, 048

0020

DEF 071, 'AND', 0, 0, 20, 037, 051

0025

DEF 071, 'RY1', 080, 024, 027, 021

0030

DEF 071, 'AND', 0, 0, 25, 033, 03A

0035

DEF 072, 'CAS', 0, 0, 35, 033, 044

0040

DEF 074, 'AND', 0, 1, 37, 029, 052

0000	70	0005	DEF	070,'AND',0,7,028,058
0001	41			
0002	4E			
0003	44			
0004	00	0040	DEF	073,'AND',0,008,030,040
0005	07			
0006	08			
0007	58			
0008	74	0010	DEF	071,'CAS',0,8,059,2
0009	43			
000A	41			
000B	53			
000C	00	0050	DEF	070,'CAS',0,039,056,025
000D	09			
000E	59			
000F	02			
0010	80	0015	DEF	080,'AND',0,017,036,040
0011	41			
0012	4E			
0013	44			
0014	00	0055	DEF	071,'CCT',060,043,019,5
0015	17			
0016	36			
0017	40			
0018	7F	0020	DEF	07F,'AND',0,020,037,051
0019	41			
001A	4E			
001B	44			
001C	00	0060	DEF	070,'CAS',0,042,048,010
001D	20			
001E	37			
001F	51			
0020	74	0025	DEF	071,'HYI',080,024,077,021
0021	48			
0022	59			
0023	49			
0024	80	0065	DEF	075,'AND',0,046,038,02
0025	24			
0026	77			
0027	21			
0028	7E	0030	DEF	07E,'AND',0,035,033,036
0029	41			
002A	4E			
002B	44			
002C	00	0070	DEF	072,'CAS',0,050,040,026
002D	35			
002E	33			
002F	36			
0030	75	0035	DEF	075,'CAS',0,035,053,046
0031	43			
0032	41			
0033	53			
0034	00	0075	DEF	076,'AND',0,055,038,003
0035	35			
0036	53			
0037	46			
0038	74	0040	DEF	074,'AND',0,037,029,012
0039	41			
003A	4E			
003B	44			

0030	00				
0030	37				
003E	29				
003F	12				
0040	73	0045	DEF	073, 'AND', 0, 038, 030, 044	
0041	41				
0042	4E				
0043	44				
0044	00	0005	DEF	171, 'AND', 1, 5, 035, 030	
0045	39				
0046	30				
0047	44				
0048	70	0050	DEF	070, 'CAS', 0, 039, 056, 025	
0049	43				
004A	41				
004B	53				
004C	00	0070	DEF	177, 'CET', 001, 023, 0, 010	
004D	39				
004E	56				
004F	25				
0050	74	0055	DEF	071, 'CET', 080, 042, 018, 5	
0051	43				
0052	45				
0053	54				
0054	90	0095	DEF	173, 'CAS', 1, 024, 060, 7	
0055	42				
0056	18				
0057	05				
0058	70	0060	DEF	070, 'CAS', 0, 043, 048, 010	
0059	43				
005A	41				
005B	53				
005C	00	0100	DEF	170, 'CET', 001, 036, 007, 019	
005D	43				
005E	49				
005F	10				
0060	75	0065	DEF	075, 'AND', 0, 046, 024, 9	
0061	41				
0062	4E				
0063	44				
0064	00	0105	DEF	ACNE', 001, 036, 057, 019	
0065	44				
0066	24				
0067	09				
0068	72	0070	DEF	072, 'CAS', 0, 055, 060, 036	
0069	43				
006A	41				
006B	53				
006C	00	0110	DEF	101, 'CET', 001, 043, 016, 11	
006D	55				
006E	40				
006F	36				
0070	7A	0075	DEF	07A, 'AND', 0, 055, 038, 023	
0071	41				
0072	4E				
0073	44				
0074	00	0115	DEF	175, 'CET', 001, 050, 010, 003	
0075	55				
0076	39				
0077	23				

0078	74	0080	DEF	076,'CET',081,7,010,017
0079	43			
007A	45			
007B	54			
007C	81	0120	DEF	071,'ALL',1,003,010,042
007D	07			
007E	10			
007F	17			
0080	71	0085	DEF	071,'AND',1,8,035,030
0081	41			
0082	4E			
0083	44			
0084	01	0125	DEF	070,'NYI',081,058,061,058
0085	08			
0086	35			
0087	30			
0088	77	0090	DEF	077,'CET',081,023,8,016
0089	42			
008A	45			
008B	54			
008C	81	0130	DEF	078,'LET',081,059,061,010
008D	22			
008E	08			
008F	16			
0090	73	0095	DEF	073,'CAS',1,024,060,7
0091	42			
0092	41			
0093	53			
0094	01	0135	DEF	072,'AND',2,2,042,011
0095	24			
0096	40			
0097	07			
0098	70	0100	DEF	070,'ERI',081,036,057,019
0099	45			
009A	52			
009B	49			
009C	81	0540	DEF	078,'ARI',2,6,083,021
009D	36			
009E	57			
009F	19			
00A0	41	0105	DEF	'ACHE',081,036,057,019
00A1	43			
00A2	48			
00A3	45			
00A4	81	0145	DEF	070,'EET',2,011,6,045
00A5	36			
00A6	57			
00A7	19			
00A8	81	0110	DEF	081,'CEL',081,043,016,2
00A9	43			
00AA	45			
00AB	40			
00AC	81	0150	DEF	074,'TVE',082,010,038,048
00AD	43			
00AE	16			
00AF	02			
00B0	75	0115	DEF	075,'CET',081,050,010,025
00B1	42			
00B2	45			
00B3	54			

00B4 84	0120	DEF	071, 'ARI', 1, 053, 020, 042
00B5 50			
00B6 10			
00B7 25			
00B8 74	0120	DEF	071, 'ARI', 1, 053, 020, 042
00B9 44			
00BA 52			
00BB 49			
00BC 04	0120	DEF	072, 'HYI', 082, 021, 048, 044
00BD 52			
00BE 20			
00BF 42			
00C0 70	0125	DEF	070, 'HYI', 081, 058, 061, 039
00C1 48			
00C2 59			
00C3 49			
00C4 84	0125	DEF	072, 'HYI', 082, 021, 074, 044
00C5 58			
00C6 34			
00C7 39			
00C8 78	0130	DEF	078, 'CET', 081, 059, 021, 010
00C9 43			
00CA 45			
00CB 54			
00CC 84	0120	DEF	078, 'ARI', 2, 059, 021, 042
00CD 59			
00CE 24			
00CF 10			
00D0 72	0135	DEF	072, 'AND', 2, 2, 042, 013
00D1 44			
00D2 4E			
00D3 44			
00D4 02	0175	DEF	073, 'CET', 2, 038, 0, 012
00D5 02			
00D6 42			
00D7 12			
00D8 70	0140	DEF	070, 'ARI', 2, 6, 023, 021
00D9 44			
00DA 52			
00DB 49			
00DC 02	0180	DEF	074, 'HYI', 082, 037, 048, 020
00DD 06			
00DE 22			
00DF 24			
00E0 70	0145	DEF	070, 'CET', 2, 011, 8, 045
00E1 42			
00E2 45			
00E3 54			
00E4 02	0185	DEF	07E, 'CET', 082, 043, 013, 054
00E5 11			
00E6 08			
00E7 45			
00E8 7A	0150	DEF	07A, 'FOR', 082, 012, 030, 048
00E9 46			
00EA 4E			
00EB 52			
00EC 92	0190	DEF	07A, 'CET', 2, 042, 010, 1
00ED 12			
00EE 30			
00EF 48			

00F0	83	0155	DEF	083, 'ERI', 2, 015, 051, 035
00F1	45			
00F2	52			
00F3	49			
00F4	82	0195	DEF	071, 'IDE', 082, 048, 032, 029
00F5	15			
00F6	54			
00F7	35			
00F8	73	0160	DEF	073, 'HYI', 082, 021, 068, 044
00F9	48			
00FA	59			
00FB	49			
00FC	82	0200	DEF	080, 'ARI', 2, 050, 075, 057
00FD	24			
00FE	68			
00FF	44			
0100	7A	0165	DEF	07A, 'HYI', 082, 031, 079, 011
0101	48			
0102	59			
0103	49			
0104	82	0205	DEF	076, 'ERI', 082, 055, 0-058
0105	34			
0106	79			
0107	14			
0108	78	0170	DEF	07B, 'ARI', 2, 037, 021, 052
0109	44			
010A	52			
010B	49			
010C	82	0210	DEF	072, 'ERI', 082, 053, 040, 050
010D	37			
010E	24			
010F	52			
0110	73	0175	DEF	073, 'CET', 2, 038, 0, 014
0111	43			
0112	45			
0113	54			
0114	82	0215	DEF	079, 'CET', 2, 058, 0, 047
0115	38			
0116	88			
0117	14			
0118	74	0180	DEF	074, 'HYI', 082, 039, 068, 020
0119	48			
011A	59			
011B	49			
011C	82	0220	DEF	070, 'CET', 2, 044, 0
011D	39			
011E	68			
011F	20			
0120	7E	0185	DEF	07E, 'CET', 082, 043, 013, 056
0121	43			
0122	45			
0123	54			
0124	82	0225	DEF	07A, 'HOR', 083, 0, 059, 048
0125	43			
0126	13			
0127	56			
0128	7A	0190	DEF	07A, 'CET', 2, 043, 010, 1
0129	43			
012A	48			
012B	54			

012C	02	0190	DEF	073, 'FOR', 2, 010, 019, 050
012D	43			
012E	40			
012F	01			
0130	71	0195	DEF	071, 'FOR', 082, 048, 032, 029
0131	46			
0132	4F			
0133	52			
0134	92	0235	DEF	075, 'ERI', 083, 014, 8, 073
0135	48			
0136	32			
0137	29			
0138	90	0200	DEF	080, 'ARI', 2, 050, 014, 059
0139	41			
013A	52			
013B	49			
013C	02	0240	DEF	074, 'ERI', 083, 031, 4, 024
013D	50			
013E	44			
013F	59			
0140	74	0205	DEF	076, 'ERI', 082, 055, 8, 058
0141	45			
0142	52			
0143	49			
0144	92	0245	DEF	073, 'ERI', 83, 042, 4, 049
0145	55			
0146	09			
0147	59			
0148	77	0210	DEF	077, 'ERI', 082, 057, 040, 022
0149	45			
014A	52			
014B	49			
014C	92	0250	DEF	072, 'ERI', 083, 047, 074, 017
014D	57			
014E	40			
014F	22			
0150	79	0215	DEF	079, 'CET', 2, 058, 8, 049
0151	43			
0152	45			
0153	54			
0154	02	0255	DEF	072, 'ERI', 083, 057, 013, 033
0155	59			
0156	09			
0157	49			
0158	70	0220	DEF	070, 'CET', 3, 1, 4, 0
0159	43			
015A	45			
015B	54			
015C	02	0260	DEF	070, 'HOR', 084, 013, 042, 020
015D	01			
015E	04			
015F	00			
0160	7A	0225	DEF	07A, 'HOR', 083, 3, 059, 048
0161	48			
0162	4F			
0163	52			
0164	93	0265	DEF	072, 'ERI', 084, 015, 051, 081
0165	03			
0166	59			
0167	48			

0169 73	0330	DEF	073, 'ARI', 3, 010, 019, 038
0169 44			
016A 52			
016B 49			
016C 02	0270	DEF	070, 'TOW', 084, 032, 055, 0
016D 10			
016E 19			
016F 39			
0170 25	0235	DEF	075, 'ERI', 083, 014, 8, 053
0171 45			
0172 52			
0173 49			
0174 93	0275	DEF	075, 'ERT', 084, 035, 3, 023
0175 14			
0176 09			
0177 53			
0178 74	0240	DEF	074, 'ERI', 083, 031, 9, 031
0179 45			
017A 52			
017B 49			
017C 93	0280	DEF	074, 'ERI', 084, 044, 3, 017
017D 31			
017E 09			
017F 34			
0180 73	0245	DEF	073, 'ERI', 83, 042, 9, 049
0181 45			
0182 52			
0183 49			
0184 53	0295	DEF	074, 'ARI', 5, 0, 043, 047
0185 42			
0186 09			
0187 49			
0189 73	0250	DEF	072, 'HYI', 083, 047, 074, 017
0189 49			
018A 59			
018B 49			
018C 93	0299	DEF	074, 'AQR', 5, 0, 041, 012
018D 47			
018E 74			
018F 17			
0190 73	0255	DEF	072, 'ERI', 083, 057, 013, 033
0191 45			
0192 52			
0193 49			
0194 93	0298	DEF	071, 'ERI', 083, 6, 5, 6
0195 57			
0196 13			
0197 33			
0198 70	0260	DEF	070, 'HOR', 084, 013, 042, 020
0199 49			
019A 4F			
019B 52			
019C 94	0300	DEF	075, 'ERI', 085, 0, 8, 042
019D 13			
019E 42			
019F 20			
01A0 72	0265	DEF	072, 'DOR', 084, 015, 051, 031
01A1 44			
01A2 4F			
01A3 52			

01A4	84	0270	DEF	07A, 'AUR', 5, 013, 026, 027
01A5	15			
01A6	51			
01A7	31			
01A8	70	0270	DEF	070, 'DOR', 084, 033, 055, 4
01A9	44			
01AA	4F			
01AB	52			
01AC	84	0310	DEF	072, 'DOR', 085, 013, 067, 012
01AD	33			
01AE	55			
01AF	04			
01B0	78	0275	DEF	07B, 'ERI', 084, 035, 3, 023
01B1	45			
01B2	52			
01B3	49			
01B4	84	0315	DEF	070, 'AUR', 5, 015, 045, 034
01B5	35			
01B6	03			
01B7	23			
01B8	7A	0280	DEF	07A, 'ERI', 084, 044, 3, 017
01B9	45			
01BA	52			
01BB	49			
01BC	84	0320	DEF	'CAPI', 5, 015, 045, 034
01BD	44			
01BE	03			
01BF	17			
01C0	74	0285	DEF	074, 'AUR', 5, 0, 043, 047
01C1	44			
01C2	55			
01C3	52			
01C4	05	0335	DEF	070, 'AUR', 085, 016, 034, 054
01C5	00			
01C6	42			
01C7	47			
01C8	76	0290	DEF	076, 'AUR', 5, 5, 041, 012
01C9	44			
01CA	55			
01CB	52			
01CC	05	0330	DEF	071, 'DOR', 085, 038, 042, 054
01CD	05			
01CE	44			
01CF	12			
01D0	71	0295	DEF	071, 'ERI', 085, 6, 5, 6
01D1	45			
01D2	52			
01D3	49			
01D4	95	0335	DEF	070, 'DOR', 085, 038, 034, 4
01D5	04			
01D6	05			
01D7	04			
01D8	79	0300	DEF	079, 'ERI', 085, 8, 8, 046
01D9	45			
01DA	52			
01DB	49			
01DC	95	0340	DEF	078, 'AUR', 5, 008, 039, 054
01DD	08			
01DE	08			
01DF	44			

01E0	7A	0305	DEF	07A, 'AUR', 5, 012, 038, 027
01E1	44			
01E2	55			
01E3	52			
01E4	05	0345	DEF	071, 'COL', 085, 050, 039, 046
01E5	12			
01E6	39			
01E7	27			
01E8	77	0310	DEF	077, 'DOR', 085, 013, 067, 012
01E9	44			
01EA	4F			
01EB	52			
01EC	95	0350	DEF	075, 'AUR', 5, 058, 044, 051
01ED	12			
01EE	67			
01EF	12			
01F0	70	0315	DEF	070, 'AUR', 5, 015, 045, 058
01F1	44			
01F2	55			
01F3	52			
01F4	05	0355	DEF	07C, 'CNA', 084, 019, 076, 3
01F5	15			
01F6	45			
01F7	59			
01F8	43	0320	DEF	'CAPE', 5, 015, 045, 058
01F9	44			
01FA	50			
01FB	45			
01FC	05	0360	DEF	076, 'DOR', 4, 021, 022, 024
01FD	15			
01FE	45			
01FF	59			
0200	70	0325	DEF	07D, 'COL', 085, 016, 034, 054
0201	43			
0202	4F			
0203	4C			
0204	95	0365	DEF	071, 'CNA', 084, 021, 017, 051
0205	14			
0206	34			
0207	54			
0208	74	0330	DEF	071, 'DOR', 085, 033, 062, 029
0209	44			
020A	4F			
020B	52			
020C	95	0370	DEF	083, 'AUR', 5, 023, 049, 017
020D	33			
020E	62			
020F	39			
0210	70	0335	DEF	070, 'COL', 085, 038, 034, 4
0211	43			
0212	4F			
0213	4C			
0214	95	0375	DEF	07B, 'CNA', 084, 023, 052, 040
0215	39			
0216	34			
0217	04			
0218	79	0340	DEF	07B, 'AUR', 5, 050, 039, 8
0219	44			
021A	55			
021B	52			

0210 05	0380	DEF	070, 'COL', 085, 050, 035, 046
0210 50			
021E 39			
021F 09			
0220 71	0345	DEF	071, 'COL', 085, 050, 035, 046
0224 43			
0222 4F			
0223 4C			
0224 95	0385	DEF	072, 'GEN', 6, 036, 015, 024
0225 50			
0226 35			
0227 46			
0229 71	0350	DEF	071, 'AUR', 5, 058, 044, 056
0229 44			
022A 55			
0229 52			
0220 05	0390	DEF	074, 'GEN', 6, 042, 025, 0
0229 59			
022E 44			
022F 56			
0230 7C	0355	DEF	07C, 'CMA', 086, 019, 030, 3
0234 43			
0232 4D			
0233 44			
0234 86	0395	DEF	07C, 'GEN', 6, 044, 017, 056
0235 49			
0236 30			
0237 03			
0239 7A	0360	DEF	07A, 'GEM', 6, 021, 022, 031
0239 47			
023A 45			
0239 4D			
0230 06	0400	DEF	07D, 'CMA', 086, 044, 016, 041
0230 24			
023E 22			
023F 34			
0240 74	0365	DEF	071, 'CMA', 086, 021, 017, 056
0241 43			
0242 4D			
0243 44			
0244 86	0405	DEF	'SIRI', 086, 044, 016, 041
0245 24			
0246 47			
0247 56			
0249 93	0370	DEF	083, 'AUR', 6, 023, 049, 017
0249 44			
024A 55			
024B 52			
024C 06	0410	DEF	077, 'GEN', 6, 051, 033, 058
024D 23			
024E 49			
024F 47			
0250 70	0375	DEF	070, 'CAR', 086, 023, 052, 040
0254 43			
0252 44			
0253 52			
0254 86	0415	DEF	077, 'CMA', 086, 052, 032, 0
0255 23			
0256 52			
0257 40			

0258 48	0380	DEF	'CANO',086,023,052,040
0259 41			
025A 4E			
025B 4F			
025C 86	0420	DEF	'CMA',086,052,028,056
025D 23			
025E 52			
025F 40			
0260 72	0385	DEF	072,'GEM',6,036,016,024
0261 47			
0262 45			
0263 4D			
0264 06	0425	DEF	180,'CMA',087,01,027,054
0265 36			
0266 16			
0267 24			
0268 74	0390	DEF	074,'GEM',6,042,025,8
0269 47			
026A 45			
026B 4D			
026C 06	0430	DEF	173,'CMA',087,2,010,024
026D 42			
026E 35			
026F 09			
0270 7C	0395	DEF	07C,'GEM',6,044,012,054
0271 47			
0272 45			
0273 4D			
0274 06	0435	DEF	175,'CMA',7,2,020,035
0275 44			
0276 42			
0277 54			
0278 70	0400	DEF	070,'CMA',086,044,016,041
0279 43			
027A 4D			
027B 41			
027C 96	0440	DEF	173,'CMA',087,7,026,021
027D 44			
027E 46			
027F 41			
0280 53	0405	DEF	'SIRI',086,044,016,041
0281 49			
0282 52			
0283 49			
0284 96	0445	DEF	179,'CMA',7,516,016,036
0285 44			
0286 46			
0287 41			
0288 77	0410	DEF	077,'GEM',6,051,033,058
0289 47			
028A 45			
028B 4D			
028C 06	0450	DEF	173,'CMA',7,018,022,0
028D 51			
028E 33			
028F 59			
0290 77	0415	DEF	077,'CMA',086,053,012,0
0291 43			
0292 4D			
0293 41			

0294	86		DEF	076, 'CMA', 087, 029, 029, 092
0295	53			
0296	42			
0297	00			
0298	74	0420	DEF	074, 'CMA', 086, 057, 028, 056
0299	43			
029A	4D			
029B	44			
029C	86	0460	DEF	071, 'CMA', 7, 008, 8, 017
029D	57			
029E	29			
029F	56			
02A0	80	0425	DEF	080, 'CMA', 087, 0, 027, 054
02A1	43			
02A2	4D			
02A3	44			
02A4	87	0465	DEF	079, 'CMA', 7, 009, 031, 099
02A5	00			
02A6	27			
02A7	54			
02A8	72	0430	DEF	072, 'CMA', 087, 2, 015, 036
02A9	43			
02AA	4D			
02AB	44			
02AC	87	0470	DEF	070, 'CMA', 7, 030, 021, 092
02AD	02			
02AE	15			
02AF	26			
02B0	75	0435	DEF	075, 'CMA', 7, 2, 020, 035
02B1	47			
02B2	45			
02B3	4D			
02B4	87	0475	DEF	081, 'CMA', 7, 033, 031, 025
02B5	02			
02B6	20			
02B7	35			
02B8	73	0440	DEF	073, 'CMA', 087, 7, 026, 021
02B9	43			
02BA	4D			
02BB	44			
02BC	87	0480	DEF	082, 'CMA', 7, 036, 026, 026
02BD	07			
02BE	26			
02BF	24			
02C0	79	0445	DEF	079, 'CMA', 7, 016, 016, 034
02C1	47			
02C2	45			
02C3	4D			
02C4	07	0485	DEF	070, 'CMA', 7, 030, 5, 016
02C5	16			
02C6	16			
02C7	34			
02C8	73	0450	DEF	073, 'CMA', 7, 018, 022, 0
02C9	47			
02CA	45			
02CB	4D			
02CC	07	0490	DEF	080, 'CMA', 7, 038, 5, 018
02CD	18			
02CE	22			
02CF	00			

02D0	74	0455	DEF	076, 'CMA', 087, 023, 029, 015
02D1	43			
02D2	4D			
02D3	44			
02D4	87	0475	DEF	074, 'NER', 7, 043, 028, 4
02D5	33			
02D6	29			
02D7	45			
02D8	74	0460	DEF	071, 'CMI', 7, 026, 8, 019
02D9	43			
02DA	4D			
02DB	49			
02DC	07	0500	DEF	'POLL', 7, 044, 028, 4
02DD	26			
02DE	08			
02DF	49			
02E0	7F	0465	DEF	07F, 'GEM', 7, 027, 031, 049
02E1	47			
02E2	45			
02E3	4D			
02E4	07	0505	DEF	093, 'GER', 7, 052, 022, 048
02E5	27			
02E6	34			
02E7	49			
02E8	70	0470	DEF	070, 'GEM', 7, 033, 031, 055
02E9	47			
02EA	45			
02EB	4D			
02EC	07	0510	DEF	071, 'CMC', 8, 015, 9, 014
02ED	33			
02EE	24			
02EF	55			
02F0	42	0475	DEF	'CAST', 7, 033, 031, 055
02F1	44			
02F2	53			
02F3	54			
02F4	07	0515	DEF	073, 'CHA', 098, 021, 027, 024
02F5	33			
02F6	24			
02F7	55			
02F8	82	0480	DEF	082, 'GEM', 7, 034, 026, 056
02F9	47			
02FA	45			
02FB	4D			
02FC	07	0520	DEF	074, 'CAR', 098, 022, 027, 026
02FD	34			
02FE	26			
02FF	56			
0300	70	0485	DEF	070, 'CMI', 7, 038, 5, 016
0301	42			
0302	4D			
0303	49			
0304	07	0525	DEF	073, 'HTA', 0, 036, 0, 046
0305	38			
0306	05			
0307	13			
0308	50	0490	DEF	'PROC', 7, 038, 5, 016
0309	52			
030A	4F			
030B	43			

030C	07	0530	DEF	073, 'CHF', 0, 043, 010, 013
030D	29			
030E	05			
030F	14			
0310	21	0495	DEF	071, 'GEM', 7, 044, 028, 4
0311	47			
0312	45			
0313	40			
0314	07	0535	DEF	075, 'HYA', 0, 054, 4, 1
0315	44			
0316	29			
0317	04			
0318	50	0500	DEF	'POLL', 7, 044, 028, 4
0319	4E			
031A	4C			
031B	4C			
031C	07	0540	DEF	078, 'CNC', 0, 052, 011, 015
031D	44			
031E	29			
031F	04			
0320	82	0505	DEF	083, 'GEM', 7, 052, 026, 048
0321	47			
0322	45			
0323	40			
0324	07	0545	DEF	071, 'CAR', 089, 012, 045, 017
0325	52			
0326	26			
0327	49			
0328	74	0510	DEF	071, 'CNC', 8, 015, 9, 014
0329	43			
032A	4E			
032B	43			
032C	09	0550	DEF	072, 'HYA', 9, 013, 3, 023
032D	15			
032E	09			
032F	14			
0330	77	0515	DEF	077, 'CHA', 088, 021, 077, 025
0331	43			
0332	49			
0333	44			
0334	99	0555	DEF	078, 'HYA', 089, 026, 0, 034
0335	24			
0336	77			
0337	25			
0338	74	0520	DEF	074, 'CAR', 088, 022, 059, 026
0339	43			
033A	44			
033B	52			
033C	99	0560	DEF	074, 'ANT', 089, 028, 033, 063
033D	22			
033E	59			
033F	26			
0340	73	0525	DEF	073, 'HYA', 8, 036, 5, 046
0341	49			
0342	59			
0343	44			
0344	09	0565	DEF	077, 'ANT', 089, 043, 027, 040
0345	36			
0346	05			
0347	44			

0348 73	0530	DEF	073, 'CNC', 8, 043, 018, 013
0349 43			
034A 4E			
034B 4B			
034C 09	0570	DEF	074, 'ANT', 089, 028, 035, 051
034D 43			
034E 18			
034F 13			
0350 75	0535	DEF	075, 'HYA', 8, 054, 6, 1
0351 48			
0352 59			
0353 44			
0354 09	0575	DEF	076, 'HYA', 090, 012, 015
0355 54			
0356 06			
0357 04			
0358 70	0540	DEF	070, 'CNC', 8, 057, 011, 055
0359 43			
035A 4E			
035B 43			
035C 09	0580	DEF	085, 'CAR', 090, 013, 068, 056
035D 57			
035E 14			
035F 55			
0360 74	0545	DEF	071, 'CAR', 089, 012, 069, 037
0361 43			
0362 44			
0363 52			
0364 89	0585	DEF	076, 'HYA', 090, 025, 016, 043
0365 12			
0366 69			
0367 37			
0368 77	0550	DEF	077, 'HYA', 9, 013, 2, 023
0369 48			
036A 59			
036B 44			
036C 09	0590	DEF	078, 'ANT', 090, 028, 030, 057
036D 13			
036E 02			
036F 23			
0370 70	0555	DEF	070, 'HYA', 089, 026, 8, 034
0371 48			
0372 59			
0373 44			
0374 89	0595	DEF	077, 'CAR', 090, 043, 064, 017
0375 26			
0376 08			
0377 34			
0378 74	0560	DEF	074, 'ANT', 089, 028, 035, 051
0379 44			
037A 4E			
037B 54			
037C 89	0600	DEF	078, 'HYA', 090, 046, 016, 5
037D 29			
037E 35			
037F 54			
0380 77	0565	DEF	077, 'ANT', 089, 043, 027, 040
0381 44			
0382 4E			
0383 54			

0384	99	0505	DEF	070, 'LRT', 090, 038, 018, 091
0385	43			
0386	37			
0387	40			
0388	76	0570	DEF	076, 'ANT', 089, 058, 035, 047
0389	41			
038A	4E			
038B	54			
038C	99	0610	DEF	078, 'LRT', 091, 010, 022, 042
038D	58			
038E	35			
038F	47			
0390	79	0575	DEF	079, 'HYA', 090, 9, 012, 015
0391	48			
0392	59			
0393	41			
0394	90	0615	DEF	073, 'LRT', 091, 018, 014, 040
0395	09			
0396	12			
0397	15			
0398	85	0580	DEF	085, 'CAR', 090, 013, 069, 056
0399	43			
039A	41			
039B	52			
039C	90	0620	DEF	07E, 'LEN', 091, 020, 054, 022
039D	13			
039E	69			
039F	56			
03A0	7A	0585	DEF	07A, 'HYA', 090, 025, 016, 043
03A1	48			
03A2	59			
03A3	41			
03A4	90	0625	DEF	072, 'LRT', 091, 023, 017, 034
03A5	25			
03A6	16			
03A7	43			
03A8	70	0590	DEF	070, 'ANT', 090, 026, 030, 057
03A9	41			
03AA	4E			
03AB	54			
03AC	90	0630	DEF	075, 'HYA', 091, 032, 091, 044
03AD	26			
03AE	30			
03AF	57			
03B0	77	0595	DEF	077, 'CAR', 090, 042, 064, 017
03B1	43			
03B2	41			
03B3	52			
03B4	90	0635	DEF	079, 'LEN', 091, 034, 032, 034
03B5	42			
03B6	64			
03B7	17			
03B8	78	0600	DEF	07B, 'HYA', 090, 048, 016, 5
03B9	48			
03BA	59			
03BB	41			
03BC	90	0640	DEF	077, 'LRT', 091, 035, 91043
03BD	48			
03BE	16			
03BF	05			

03C0	70	0605	DEF	070,'CRT',090,058,018,011
03C1	43			
03C2	52			
03C3	54			
03C4	90	0605	DEF	070,'HYA',091,002,004,002
03C5	59			
03C6	19			
03C7	11			
03C8	71	0610	DEF	071,'CRT',091,010,022,042
03C9	43			
03CA	52			
03CB	54			
03CC	91	0600	DEF	070,'CRT',091,043,018,014
03CD	10			
03CE	22			
03CF	42			
03D0	73	0615	DEF	073,'CRT',091,018,014,040
03D1	43			
03D2	52			
03D3	54			
03D4	91	0605	DEF	076,'CRT',091,054,017,02
03D5	19			
03D6	14			
03D7	40			
03D8	75	0620	DEF	07E,'CEN',091,020,054,022
03D9	43			
03DA	45			
03DB	4E			
03DC	91	0660	DEF	073,'CEN',092,7,050,006
03DD	20			
03DE	54			
03DF	22			
03E0	72	0625	DEF	072,'CRT',091,023,017,034
03E1	42			
03E2	52			
03E3	54			
03E4	91	0665	DEF	074,'CEN',092,9,022,030
03E5	22			
03E6	17			
03E7	34			
03E8	75	0630	DEF	075,'HYA',091,032,031,044
03E9	49			
03EA	59			
03EB	44			
03EC	91	0670	DEF	073,'CRU',092,016,058,037
03ED	32			
03EE	31			
03EF	44			
03F0	79	0635	DEF	079,'CEN',091,034,062,054
03F1	43			
03F2	45			
03F3	4E			
03F4	91	0675	DEF	072,'CRU',092,014,017,005
03F5	34			
03F6	62			
03F7	54			
03F8	77	0640	DEF	077,'CRT',091,035,9,041
03F9	43			
03FA	52			
03FB	54			

03FC 94	0640	DEF	071,'LMA',072,017,075,017
03FD 25			
03FE 09			
03FF 44			
0400 70	0645	DEF	070,'HYA',091,039,034,037
0401 48			
0402 59			
0403 44			
0404 94	0650	DEF	070,'LMA',092,025,062,050
0405 39			
0406 34			
0407 37			
0408 75	0650	DEF	075,'CRT',091,043,018,014
0409 43			
040A 52			
040B 54			
040C 94	0650	DEF	080,'CEN',092,026,050,8
040D 43			
040E 18			
040F 14			
0410 76	0655	DEF	076,'CRT',091,054,017,2
0411 43			
0412 52			
0413 54			
0414 94	0655	DEF	073,'CR0',092,028,016,030
0415 54			
0416 17			
0417 02			
0418 73	0660	DEF	073,'CEN',092,7,050,036
0419 43			
041A 45			
041B 4E			
041C 92	0700	DEF	072,'CRU',092,030,050,075
041D 07			
041E 50			
041F 36			
0420 74	0665	DEF	074,'CR0',092,9,022,030
0421 43			
0422 52			
0423 4F			
0424 92	0705	DEF	071,'CVM',012,032,041,047
0425 09			
0426 22			
0427 30			
0428 73	0670	DEF	073,'CRU',092,014,058,037
0429 43			
042A 52			
042B 55			
042C 92	0710	DEF	071,'CR0',092,033,023,016
042D 14			
042E 58			
042F 37			
0430 72	0675	DEF	072,'CR0',092,014,017,025
0431 43			
0432 52			
0433 4F			
0434 92	0715	DEF	071,'CRU',092,060,054,036
0435 14			
0436 17			
0437 25			

0439 74	0680	DEF	071, 'CHA', 092, 017, 079, 011
0439 43			
043A 39			
043B 44			
043C 92	0720	DEF	072, 'CVN', 012, 055, 038, 025
043D 17			
043E 79			
043F 14			
0440 70	0685	DEF	070, 'CRU', 092, 025, 062, 058
0441 43			
0442 52			
0443 55			
0444 92	0725	DEF	074, 'CRU', 013, 010, 027, 034
0445 25			
0446 42			
0447 58			
0449 90	0690	DEF	080, 'CEN', 092, 026, 050, 6
0449 43			
044A 45			
044B 4E			
044C 92	0730	DEF	072, 'HYA', 093, 017, 027, 3
044D 26			
044E 50			
044F 06			
0450 73	0695	DEF	073, 'CR0', 092, 028, 016, 024
0451 43			
0452 52			
0453 4F			
0454 92	0735	DEF	074, 'CRU', 073, 036, 055, 27
0455 29			
0456 16			
0457 24			
0459 72	0700	DEF	072, 'CRU', 092, 030, 056, 059
0459 43			
045A 52			
045B 55			
045C 92	0740	DEF	074, 'CRU', 093, 048, 0619, 33
045D 30			
045E 56			
045F 59			
0460 74	0705	DEF	071, 'CVN', 012, 032, 041, 027
0461 43			
0462 56			
0463 4E			
0464 12	0745	DEF	076, 'S00', 013, 053, 019, 025
0465 32			
0466 44			
0467 37			
0469 74	0710	DEF	071, 'CR0', 092, 033, 023, 016
0469 43			
046A 52			
046B 4F			
046C 92	0750	DEF	075, 'CRU', 093, 054, 067, 044
046D 33			
046E 23			
046F 16			
0470 71	0715	DEF	071, 'CRU', 092, 046, 059, 034
0471 43			
0472 52			
0473 55			

0474	92	0720	DEF	070, 'CEN', 094, 2, 066, 016
0475	44			
0476	59			
0477	34			
0478	70	0720	DEF	070, 'CVN', 012, 055, 038, 025
0479	43			
047A	56			
047B	4E			
047C	12	0760	DEF	070, 'ORA', 014, 3, 064, 027
047D	55			
047E	38			
047F	25			
0480	74	0725	DEF	071, 'COM', 013, 010, 027, 058
0481	43			
0482	4F			
0483	4D			
0484	13	0765	DEF	072, 'HYA', 094, 5, 026, 086
0485	10			
0486	27			
0487	58			
0488	72	0730	DEF	072, 'HYA', 093, 017, 023, 3
0489	48			
048A	59			
048B	44			
048C	93	0770	DEF	077, 'CEN', 094, 5, 036, 096
048D	17			
048E	23			
048F	83			
0490	74	0735	DEF	074, 'CEN', 093, 038, 053, 021
0491	43			
0492	45			
0493	4E			
0494	93	0775	DEF	078, 'BOO', 014, 014, 019, 016
0495	38			
0496	53			
0497	24			
0498	7A	0740	DEF	07A, 'CEN', 093, 048, 0412, 022
0499	43			
049A	45			
049B	4E			
049C	93	0780	DEF	'ARCT', 014, 014, 019, 016
049D	48			
049E	42			
049F	22			
04A0	74	0745	DEF	076, 'BOO', 013, 053, 018, 029
04A1	42			
04A2	4F			
04A3	4F			
04A4	13	0785	DEF	084, 'CEN', 094, 019, 032, 047
04A5	53			
04A6	18			
04A7	29			
04A8	75	0750	DEF	075, 'CEN', 093, 054, 047, 011
04A9	43			
04AA	45			
04AB	4E			
04AC	93	0290	DEF	077, 'BOO', 014, 024, 051, 052
04AD	54			
04AE	47			
04AF	14			

04B0	74	0755	DEF	071, 'CEN', 094, 2, 060, 016
04B1	43			
04B2	45			
04B3	4E			
04B4	94	0795	DEF	07F, 'B00', 014, 030, 030, 027
04B5	02			
04B6	60			
04B7	14			
04B8	70	0760	DEF	070, 'DRA', 014, 3, 064, 027
04B9	44			
04BA	52			
04BB	41			
04BC	14	0800	DEF	072, 'B00', 014, 021, 030, 023
04BD	03			
04BE	64			
04BF	27			
04C0	7E	0765	DEF	07E, 'HYA', 094, 5, 026, 034
04C1	48			
04C2	59			
04C3	41			
04C4	94	0805	DEF	060, 'B00', 014, 033, 025, 042
04C5	05			
04C6	26			
04C7	34			
04C8	77	0770	DEF	077, 'CEN', 094, 5, 036, 016
04C9	43			
04CA	45			
04CB	4E			
04CC	94	0810	DEF	076, 'CEN', 094, 034, 052, 042
04CD	05			
04CE	36			
04CF	16			
04D0	70	0775	DEF	070, 'B00', 014, 014, 019, 016
04D1	42			
04D2	4E			
04D3	4E			
04D4	14	0815	DEF	070, 'CEN', 094, 038, 023, 042
04D5	14			
04D6	19			
04D7	16			
04D8	41	0780	DEF	'ARCT', 014, 014, 019, 016
04D9	52			
04DA	43			
04DB	54			
04DC	14	0820	DEF	070, 'B00', 094, 045, 078, 025
04DD	14			
04DE	19			
04DF	16			
04E0	94	0785	DEF	084, 'CEN', 094, 019, 037, 047
04E1	43			
04E2	45			
04E3	4E			
04E4	94	0825	DEF	071, 'B00', 015, 1, 048, 025
04E5	19			
04E6	37			
04E7	47			
04E8	77	0790	DEF	077, 'B00', 014, 024, 051, 056
04E9	42			
04EA	4F			
04EB	4F			

04EC	14	0830	DEF	073,'B00',015,014,030,023
04ED	24			
04EE	54			
04EF	56			
04F0	7F	0795	DEF	07F,'B00',014,030,030,027
04F1	42			
04F2	4F			
04F3	4F			
04F4	14	0835	DEF	074,'CEN',015,028,029,010
04F5	30			
04F6	30			
04F7	37			
04F8	72	0800	DEF	072,'B00',014,031,038,023
04F9	42			
04FA	4F			
04FB	4F			
04FC	14	0840	DEF	077,'CEN',015,032,034,025
04FD	34			
04FE	39			
04FF	33			
0500	90	0805	DEF	080,'B00',014,033,029,049
0501	42			
0502	4F			
0503	4F			
0504	14	0845	DEF	070,'CEN',015,033,026,010
0505	33			
0506	39			
0507	49			
0508	76	0810	DEF	076,'CEN',094,034,042,3
0509	43			
050A	45			
050B	4E			
050C	94	0850	DEF	074,'CEN',015,035,024,025
050D	34			
050E	42			
050F	03			
0510	70	0815	DEF	070,'CEN',094,038,060,044
0511	43			
0512	45			
0513	4E			
0514	94	0855	DEF	077,'CEN',016,1,058,036
0515	39			
0516	60			
0517	44			
0518	70	0820	DEF	070,'APO',094,045,078,057
0519	44			
051A	50			
051B	4F			
051C	94	0860	DEF	080,'CEN',016,8,036,032
051D	45			
051E	79			
051F	57			
0520	74	0825	DEF	071,'B00',015,1,040,027
0521	42			
0522	4F			
0523	4F			
0524	15	0865	DEF	081,'CEN',016,017,046,021
0525	04			
0526	40			
0527	27			

0528	73	0830	DEF	073, 'B00', 015, 014, 033, 023
0529	42			
052A	4E			
052B	4E			
052C	15	0870	DEF	072, 'HER', 014, 021, 019, 017
052D	14			
052E	33			
052F	23			
0530	74	0835	DEF	071, 'CRB', 015, 026, 029, 010
0531	43			
0532	52			
0533	42			
0534	15	0875	DEF	084, 'HER', 015, 024, 014, 0
0535	26			
0536	29			
0537	10			
0538	77	0840	DEF	077, 'CRB', 015, 032, 031, 025
0539	43			
053A	52			
053B	42			
053C	15	0800	DEF	071, 'HER', 015, 029, 021, 021
053D	32			
053E	34			
053F	25			
0540	70	0845	DEF	070, 'CRB', 015, 033, 026, 046
0541	43			
0542	52			
0543	42			
0544	15	0805	DEF	072, 'AP0', 015, 030, 018, 037
0545	33			
0546	26			
0547	46			
0548	74	0850	DEF	074, 'CRB', 015, 056, 026, 055
0549	43			
054A	52			
054B	42			
054C	15	0890	DEF	080, 'HER', 015, 033, 042, 028
054D	56			
054E	26			
054F	55			
0550	77	0855	DEF	077, 'DRA', 016, 1, 058, 036
0551	44			
0552	52			
0553	44			
0554	16	0895	DEF	076, 'HER', 015, 042, 038, 037
0555	04			
0556	58			
0557	36			
0558	80	0860	DEF	080, 'CRB', 016, 8, 036, 032
0559	43			
055A	52			
055B	42			
055C	16	0900	DEF	076, 'ARA', 015, 048, 037, 0
055D	08			
055E	36			
055F	32			
0560	84	0865	DEF	081, 'HER', 016, 019, 046, 021
0561	48			
0562	45			
0563	52			

0564	16	0905	DEF	072, 'HER', 016, 026, 025, 027
0565	19			
0566	46			
0567	24			
0568	72	0870	DEF	072, 'HER', 016, 021, 019, 011
0569	48			
056A	45			
056B	52			
056C	16	0910	DEF	074, 'HER', 016, 029, 020, 022
056D	24			
056E	19			
056F	14			
0570	84	0875	DEF	084, 'HER', 016, 024, 014, 4
0571	48			
0572	45			
0573	52			
0574	16	0915	DEF	073, 'HER', 017, 014, 024, 028
0575	24			
0576	14			
0577	04			
0578	74	0880	DEF	071, 'HER', 016, 029, 021, 031
0579	48			
057A	45			
057B	52			
057C	16	0920	DEF	072, 'HER', 017, 019, 024, 026
057D	29			
057E	24			
057F	24			
0580	72	0885	DEF	072, 'APO', 096, 030, 078, 050
0581	44			
0582	50			
0583	4F			
0584	96	0925	DEF	071, 'ARA', 097, 023, 052, 030
0585	30			
0586	78			
0587	50			
0588	80	0890	DEF	080, 'HER', 016, 033, 042, 028
0589	48			
058A	45			
058B	52			
058C	16	0930	DEF	073, 'ARA', 097, 029, 048, 027
058D	33			
058E	42			
058F	29			
0590	76	0895	DEF	076, 'HER', 016, 042, 038, 057
0591	48			
0592	45			
0593	52			
0594	16	0935	DEF	071, 'ARA', 012, 029, 052, 018
0595	42			
0596	38			
0597	57			
0598	76	0900	DEF	076, 'ARA', 096, 048, 059, 0
0599	41			
059A	52			
059B	41			
059C	96	0940	DEF	070, 'HER', 017, 030, 045, 017
059D	48			
059E	59			
059F	00			

05A0	70	0905	DEF	07C, 'ARA', 096, 056, 055, 057
05A1	44			
05A2	52			
05A3	44			
05A4	96	0940	DEF	07A, 'HER', 017, 045, 029, 043
05A5	56			
05A6	55			
05A7	57			
05A8	74	0910	DEF	074, 'HER', 096, 059, 030, 057
05A9	48			
05AA	45			
05AB	52			
05AC	96	0950	DEF	075, 'DRA', 017, 053, 056, 050
05AD	59			
05AE	30			
05AF	57			
05B0	73	0915	DEF	073, 'HER', 017, 014, 024, 051
05B1	48			
05B2	45			
05B3	52			
05B4	17	0950	DEF	077, 'HER', 017, 055, 037, 014
05B5	14			
05B6	24			
05B7	54			
05B8	7E	0920	DEF	07E, 'HER', 017, 014, 036, 049
05B9	48			
05BA	45			
05BB	52			
05BC	17	0960	DEF	072, 'DRA', 017, 056, 054, 050
05BD	14			
05BE	36			
05BF	49			
05C0	71	0925	DEF	071, 'ARA', 097, 023, 055, 030
05C1	44			
05C2	52			
05C3	44			
05C4	97	0960	DEF	077, 'ARA', 098, 5, 050, 5
05C5	29			
05C6	55			
05C7	30			
05C8	73	0930	DEF	073, 'ARA', 097, 029, 060, 039
05C9	44			
05CA	52			
05CB	44			
05CC	97	0970	DEF	070, 'HER', 018, 5, 028, 045
05CD	29			
05CE	60			
05CF	39			
05D0	74	0935	DEF	071, 'DRA', 017, 029, 052, 018
05D1	44			
05D2	52			
05D3	44			
05D4	17	0975	DEF	077, 'DRA', 098, 037, 062, 019
05D5	29			
05D6	52			
05D7	19			
05D8	70	0940	DEF	070, 'ARA', 017, 030, 049, 051
05D9	44			
05DA	52			
05DB	44			

05DC	17	0900	DEF	070, 'DRA', 018, 050, 059, 021
05DD	30			
05DE	49			
05DF	54			
05ED	7A	0945	DEF	07A, 'HER', 017, 045, 027, 043
05E1	48			
05E2	45			
05E3	52			
05E4	17	0905	DEF	07A, 'AOL', 018, 050, 015, 2
05E5	45			
05E6	27			
05E7	43			
05E8	75	0950	DEF	075, 'DRA', 017, 053, 056, 052
05E9	44			
05EA	52			
05EB	41			
05EC	17	0990	DEF	075, 'AOL', 019, 4, 013, 049
05ED	53			
05EE	56			
05EF	52			
05F0	77	0955	DEF	077, 'HER', 017, 055, 037, 014
05F1	48			
05F2	45			
05F3	52			
05F4	17	0995	DEF	077, 'AOL', 099, 5, 4, 054
05F5	55			
05F6	37			
05F7	14			
05F8	72	0960	DEF	072, 'DRA', 017, 056, 051, 029
05F9	44			
05FA	52			
05FB	41			
05FC	17	1000	DEF	072, 'CRA', 099, 5, 037, 050
05FD	56			
05FE	51			
05FF	29			
0600	77	0965	DEF	077, 'ARA', 098, 5, 050, 5
0601	41			
0602	52			
0603	41			
0604	98	1005	DEF	084, 'AOL', 019, 016, 011, 040
0605	05			
0606	50			
0607	05			
0608	70	0970	DEF	07D, 'HER', 018, 6, 028, 045
0609	48			
060A	45			
060B	52			
060C	18	1010	DEF	077, 'AOL', 017, 024, 3, 1
060D	06			
060E	28			
060F	45			
0610	77	0975	DEF	077, 'CRA', 098, 032, 042, 019
0611	43			
0612	52			
0613	41			
0614	98	1015	DEF	071, 'LYB', 015, 029, 027, 056
0615	32			
0616	42			
0617	19			

0618 7D	0980	DEF	07D, 'DRA', 018, 050, 059, 021
0619 44			
061A 52			
061B 41			
061C 18	1020	DEF	072, 'AQL', 019, 045, 010, 033
061D 50			
061E 59			
061F 21			
0620 74	0985	DEF	074, 'AQL', 018, 058, 015, 2
0621 41			
0622 51			
0623 40			
0624 18	1025	DEF	070, 'AQL', 019, 049, 0, 048
0625 58			
0626 15			
0627 02			
0628 75	0990	DEF	075, 'AQL', 019, 4, 013, 049
0629 41			
062A 51			
062B 40			
062C 19	1030	DEF	'ALTA', 019, 049, 0, 048
062D 04			
062E 13			
062F 49			
0630 79	0995	DEF	079, 'AQL', 099, 5, 4, 054
0631 41			
0632 51			
0633 40			
0634 99	1035	DEF	072, 'AQL', 019, 051, 0, 052
0635 05			
0636 04			
0637 54			
0638 70	1000	DEF	070, 'CRA', 099, 8, 037, 055
0639 43			
063A 52			
063B 41			
063C 99	1040	DEF	071, 'AQL', 019, 052, 0, 051
063D 08			
063E 37			
063F 55			
0640 84	1005	DEF	084, 'AQL', 019, 016, 011, 033
0641 41			
0642 51			
0643 40			
0644 19	1045	DEF	071, 'CYB', 019, 055, 0, 051
0645 14			
0646 41			
0647 33			
0648 73	1010	DEF	073, 'AQL', 019, 024, 3, 4
0649 41			
064A 51			
064B 40			
064C 19	1050	DEF	071, 'AQL', 060, 010, 0, 052
064D 24			
064E 03			
064F 04			
0650 74	1015	DEF	071, 'CYG', 019, 029, 027, 054
0651 42			
0652 59			
0653 47			

0654	19	1020	DEF	071, 'CAP', 020, 010, 010, 030
0655	29			
0656	27			
0657	54			
0658	72	1020	DEF	072, 'AQL', 019, 045, 010, 033
0659	41			
065A	51			
065B	40			
065C	19	1060	DEF	072, 'CYG', 020, 021, 040, 011
065D	45			
065E	10			
065F	33			
0660	70	1025	DEF	070, 'AQL', 019, 049, 8, 048
0661	41			
0662	51			
0663	40			
0664	19	1065	DEF	074, 'AQL', 020, 032, 01, 013
0665	49			
0666	08			
0667	48			
0668	41	1030	DEF	'ALTA', 019, 049, 8, 048
0669	40			
066A	54			
066B	41			
066C	19	1070	DEF	070, 'AQL', 020, 038, 015, 038
066D	49			
066E	08			
066F	48			
0670	76	1035	DEF	076, 'AQL', 019, 051, 0, 057
0671	41			
0672	51			
0673	40			
0674	19	1075	DEF	078, 'CAP', 020, 035, 015, 041
0675	51			
0676	00			
0677	57			
0678	71	1040	DEF	071, 'AQL', 019, 054, 6, 021
0679	41			
067A	51			
067B	40			
067C	19	1080	DEF	070, 'CYG', 020, 040, 040, 012
067D	54			
067E	04			
067F	21			
0680	76	1045	DEF	076, 'CYG', 019, 055, 035, 1
0681	43			
0682	59			
0683	47			
0684	19	1085	DEF	'BENE', 020, 040, 040, 012
0685	55			
0686	35			
0687	04			
0688	77	1050	DEF	077, 'AQL', 020, 010, 0, 052
0689	41			
068A	51			
068B	40			
068C	19	1090	DEF	083, 'CAP', 020, 044, 025, 020
068D	10			
068E	00			
068F	52			

0690	74	1055	DEF	071, 'CAP', 0A0, 019, 014, 050
0691	43			
0692	44			
0693	50			
0694	80	1075	DEF	074, 'CYG', 020, 040, 011, 053
0695	19			
0696	14			
0697	50			
0698	72	1060	DEF	072, 'CYG', 020, 021, 040, 011
0699	43			
069A	59			
069B	47			
069C	20	1100	DEF	073, 'DEL', 020, 045, 016, 2
069D	24			
069E	40			
069F	14			
06A0	74	1065	DEF	074, 'DEL', 020, 032, 01, 013
06A1	44			
06A2	45			
06A3	40			
06A4	20	1105	DEF	074, 'AGB', 0A0, 046, 9, 033
06A5	32			
06A6	04			
06A7	13			
06A8	70	1070	DEF	070, 'DEL', 020, 038, 015, 050
06A9	44			
06AA	45			
06AB	40			
06AC	20	1140	DEF	084, 'CAP', 0A0, 050, 024, 059
06AD	39			
06AE	15			
06AF	50			
06B0	78	1075	DEF	078, 'CAP', 0A0, 038, 018, 012
06B1	43			
06B2	44			
06B3	50			
06B4	80	1115	DEF	070, 'CYG', 021, 4, 049, 050
06B5	39			
06B6	18			
06B7	12			
06B8	70	1080	DEF	070, 'CYG', 020, 040, 045, 012
06B9	43			
06BA	59			
06BB	47			
06BC	20	1120	DEF	077, 'CAP', 0A1, 4, 017, 018
06BD	40			
06BE	45			
06BF	12			
06C0	44	1085	DEF	'DENE', 020, 040, 045, 012
06C1	45			
06C2	4E			
06C3	45			
06C4	20	1125	DEF	078, 'AGB', 0A1, 8, 011, 026
06C5	40			
06C6	45			
06C7	12			
06C8	83	1090	DEF	083, 'CAP', 0A0, 044, 025, 020
06C9	43			
06CA	44			
06CB	50			

0400	AD			DEF	072, 'LEU', 021-1, 010-2
0401	44				
0402	25				
0403	20				
0404	74	1095		DEF	074, 'CYG', 020, 045, 033, 053
0405	43				
0406	59				
0407	47				
0408	20	1135		DEF	075, 'CYG', 021, 012, 020-8
0409	45				
0410	33				
0411	53				
0412	72	1100		DEF	072, 'DEL', 020, 045, 016, 2
0413	44				
0414	45				
0415	40				
0416	20	1140		DEF	076, 'LEU', 021, 014, 3, 9
0417	45				
0418	44				
0419	02				
0420	74	1105		DEF	074, 'AQR', 0A0, 046, 9, 033
0421	41				
0422	51				
0423	52				
0424	AD	1145		DEF	080, 'CYG', 021, 016, 035, 010
0425	46				
0426	09				
0427	33				
0428	84	1110		DEF	084, 'CAP', 0A0, 050, 026, 059
0429	43				
0430	44				
0431	50				
0432	AD	1150		DEF	079, 'CEP', 021, 018, 0A2, 029
0433	50				
0434	24				
0435	59				
0436	70	1115		DEF	070, 'CYG', 021, 4, 043, 050
0437	43				
0438	59				
0439	47				
0440	21	1155		DEF	075, 'CAP', 0A1, 025, 022, 029
0441	04				
0442	43				
0443	50				
0444	77	1120		DEF	077, 'CAP', 0A1, 4, 017, 018
0445	43				
0446	41				
0447	50				
0448	AD	1160		DEF	071, 'CEP', 021, 028, 070, 028
0449	04				
0450	17				
0451	19				
0700	78	1125		DEF	078, 'AQR', 0A1, 8, 011, 026
0701	41				
0702	51				
0703	52				
0704	AD	1165		DEF	071, 'AQR', 0A1, 030, 0, 039
0705	08				
0706	11				
0707	24				

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0709	45			
070A	54			
070B	55			
070C	24	1120	DEF	071, 'AQR', 0A1, 030, 7, 030
070D	09			
070E	10			
070F	02			
0710	75	1135	DEF	075, 'CYG', 021, 012, 030, 8
0711	43			
0712	59			
0713	47			
0714	24	1175	DEF	071, 'CAP', 0A1, 028, 012, 014
0715	12			
0716	30			
0717	08			
0718	70	1140	DEF	070, 'EQU', 021, 014, 5, 9
0719	45			
071A	54			
071B	55			
071C	24	1150	DEF	074, 'CAP', 0A1, 045, 010, 012
071D	14			
071E	05			
071F	09			
0720	80	1145	DEF	080, 'CYG', 021, 016, 039, 018
0721	43			
0722	59			
0723	47			
0724	24	1185	DEF	071, 'BRU', 0A1, 052, 037, 027
0725	14			
0726	39			
0727	18			
0728	70	1150	DEF	070, 'CEP', 021, 018, 062, 029
0729	43			
072A	45			
072B	50			
072C	24	1190	DEF	074, 'CAP', 0A1, 052, 013, 020
072D	18			
072E	42			
072F	29			
0730	75	1155	DEF	075, 'CAP', 0A1, 025, 022, 029
0731	43			
0732	44			
0733	50			
0734	41	1195	DEF	070, 'AQR', 0A2, 4, 0, 024
0735	25			
0736	22			
0737	29			
0738	74	1160	DEF	071, 'CEP', 021, 028, 070, 028
0739	43			
073A	45			
073B	50			
073C	24	1200	DEF	070, 'BRU', 0A2, 0, 047, 3
073D	28			
073E	70			
073F	28			
0740	74	1165	DEF	071, 'AQR', 0A1, 030, 5, 039
0741	41			
0742	51			
0743	52			

0744 A1	1205	DEF	079, 'AQR', 0A2, 010, 056, 05
0745 30			
0746 05			
0747 39			
0748 70	1170	DEF	07C, 'AQR', 0A1, 036, 7, 056
0749 44			
074A 54			
074B 52			
074C A1	1210	DEF	077, 'AQR', 0A2, 015, 07, 052
074D 36			
074E 07			
074F 56			
0750 72	1175	DEF	072, 'CAP', 0A1, 028, 016, 044
0751 43			
0752 41			
0753 50			
0754 A1	1215	DEF	072, 'AQR', 0A2, 020, 1, 028
0755 29			
0756 16			
0757 44			
0758 74	1180	DEF	074, 'CAP', 0A1, 045, 016, 012
0759 43			
075A 41			
075B 50			
075C A1	1220	DEF	071, 'AQR', 072, 024, 01, 016
075D 45			
075E 16			
075F 42			
0760 72	1185	DEF	072, 'GRU', 0A1, 052, 037, 027
0761 47			
0762 52			
0763 55			
0764 A1	1225	DEF	073, 'CEP', 02, 026, 058, 013
0765 52			
0766 37			
0767 27			
0768 7A	1190	DEF	07A, 'CAP', 0A1, 052, 013, 038
0769 43			
076A 41			
076B 50			
076C A1	1230	DEF	082, 'AQR', 0A2, 032, 020, 048
076D 52			
076E 43			
076F 39			
0770 70	1195	DEF	070, 'AQR', 0A2, 4, 0, 024
0771 41			
0772 54			
0773 52			
0774 A2	1235	DEF	076, 'AQR', 0A2, 034, 0, 012
0775 04			
0776 00			
0777 24			
0778 70	1200	DEF	070, 'GRU', 0A2, 6, 047, 3
0779 47			
077A 52			
077B 55			
077C A2	1240	DEF	071, 'GRU', 0A2, 0+1, 046, 059
077D 06			
077E 47			
077F 03			

0780	75	1205	DEF	075, 'CEP', 022, 010, 058, 05
0781	43			
0782	45			
0783	50			
0784	22	1243	DEF	075, 'GRU', 0A2, 047, 019, 029
0785	40			
0786	58			
0787	05			
0788	77	1210	DEF	077, 'AQR', 0A2, 015, 07, 052
0789	44			
078A	54			
078B	52			
078C	A2	1250	DEF	081, 'AQR', 0A2, 046, 012, 04
078D	45			
078E	07			
078F	52			
0790	72	1215	DEF	072, 'AQR', 0A2, 020, 1, 028
0791	44			
0792	54			
0793	52			
0794	A2	1253	DEF	079, 'AQR', 0A2, 051, 0, 042
0795	20			
0796	04			
0797	28			
0798	7E	1220	DEF	07E, 'AQR', 022, 024, 01, 016
0799	44			
079A	54			
079B	52			
079C	22	1260	DEF	073, 'AQR', 0A2, 053, 015, 050
079D	24			
079E	04			
079F	16			
07A0	73	1225	DEF	073, 'CEP', 02, 028, 058, 018
07A1	43			
07A2	45			
07A3	50			
07A4	02	1265	DEF	075, 'GRU', 0A2, 059, 052, 04
07A5	28			
07A6	58			
07A7	48			
07A8	82	1230	DEF	082, 'AQR', 0A2, 033, 020, 048
07A9	44			
07AA	54			
07AB	52			
07AC	A2	1270	DEF	078, 'AQR', 023, 0, 042, 012
07AD	33			
07AE	20			
07AF	48			
07B0	76	1235	DEF	076, 'AQR', 0A2, 034, 0, 012
07B1	44			
07B2	54			
07B3	52			
07B4	A2	1275	DEF	073, 'CEP', 028, 038, 077, 030
07B5	24			
07B6	00			
07B7	42			
07B8	74	1240	DEF	071, 'GRU', 0A2, 041, 046, 059
07B9	47			
07BA	52			
07BB	55			

07BC	A2	1240	DEF	07A, 'CAE', 022, 023, 027, 029
07BD	44			
07BE	46			
07BF	59			
07C0	74	1245	DEF	074, 'GRU', 0A2, 047, 051, 024
07C1	47			
07C2	52			
07C3	55			
07C4	A2	1245	END	*
07C5	47			
07C6	54			
07C7	24			
07C8	94	1250	DEF	081, 'AQR', 0A2, 048, 013, 041
07C9	44			
07CA	54			
07CB	52			
07CC	A2			
07CD	49			
07CE	43			
07CF	44			
07D0	79	1255	DEF	079, 'AQR', 0A2, 051, 7, 040
07D1	44			
07D2	54			
07D3	52			
07D4	A2			
07D5	54			
07D6	07			
07D7	40			
07D8	73	1260	DEF	073, 'AQR', 0A2, 053, 015, 055
07D9	44			
07DA	54			
07DB	52			
07DC	A2			
07DD	53			
07DE	15			
07DF	55			
07E0	75	1265	DEF	075, 'GRU', 0A2, 059, 052, 051
07E1	47			
07E2	52			
07E3	55			
07E4	A2			
07E5	59			
07E6	52			
07E7	54			
07E8	70	1270	DEF	07D, 'AND', 023, 0, 042, 012
07E9	44			
07EA	4E			
07EB	44			
07EC	23			
07ED	00			
07EE	42			
07EF	12			
07F0	72	1275	DEF	072, 'CEP', 023, 038, 077, 030
07F1	43			
07F2	45			
07F3	50			
07F4	23			
07F5	39			
07F6	77			
07F7	30			

07F9 7F 1280 DEF 07F,'CAS',023,053,057,023
 07F9 43
 07FA 44
 07FB 53
 07FC 23
 07FD 53
 07FE 57
 07FF 23

0900 72 1285 END *72,'P50',0,012,013,0
 0901 50
 0902 53
 0903 47
 0904 50
 0905 12
 0906 13
 0907 04

0910 75 0015 DEF 075,'TUC',080,040,045,054
 0911 54
 0912 55
 0913 32
 0914 20
 0915 18
 0916 14
 0917 59

0918 70 0020 DEF 070,'PHE',000,025,040,024
 0919 50
 0920 18
 0921 45
 0922 50
 0923 28
 0924 12
 0925 34

0926 78 0025 DEF 078,'THE',080,040,045,011
 0927 50
 0928 18
 0929 15
 0930 70
 0931 10
 0932 16
 0933 11

0934 73 0030 DEF 073,'PIS',0,047,7,020
 0935 50
 0936 49
 0937 58
 0938 00
 0939 17
 0940 57
 0941 58

0942 70 0035 DEF 070,'SCL',080,057,057,027
 0943 12
 0944 12
 0945 10
 0946 50
 0947 57
 0948 29
 0949 27

0950 74 0040 DEF 074,'PIS',1,1,7,040
 0951 50
 0952 54
 0953 53

0000 74	0005	DEF	074, 'PHE', 080, 8, 045, 051
0001 50			
0002 48			
0003 45			
0004 80	0008	DEF	081, 'PIS', 1, 010, 029, 030
0005 98			
0006 45			
0007 51			
0009 72	0010	DEF	072, 'PEG', 0, 012, 015, 4
0009 50			
000A 45			
000B 47			
000C 00	0000	DEF	082, 'PIS', 1, 018, 027, 7
000D 12			
000E 15			
000F 04			
0010 75	0015	DEF	075, 'TUC', 080, 018, 064, 059
0014 54			
0012 55			
0013 43			
0014 89	0000	DEF	072, 'PHE', 081, 029, 043, 054
0015 18			
0016 64			
0017 59			
0018 70	0020	DEF	070, 'PHE', 080, 025, 042, 024
0019 50			
001A 48			
001B 45			
001C 89	0000	DEF	074, 'PIS', 1, 030, 015, 014
001D 25			
001E 42			
001F 24			
0020 7A	0025	DEF	07A, 'PHE', 080, 040, 046, 011
0021 50			
0022 48			
0023 45			
0024 89	0000	DEF	072, 'PHE', 081, 030, 049, 010
0025 49			
0026 46			
0027 14			
0028 73	0030	DEF	073, 'PIS', 0, 047, 7, 028
0029 50			
002A 49			
002B 53			
002C 90	0070	DEF	073, 'PIS', 1, 040, 5, 023
002D 47			
002E 97			
002F 28			
0030 70	0035	DEF	070, 'SCL', 080, 057, 029, 027
0031 53			
0032 43			
0033 46			
0034 89	0075	DEF	071, 'PIS', 1, 044, 9, 3
0035 57			
0036 29			
0037 27			
0038 74	0040	DEF	074, 'PIS', 1, 1, 7, 046
0039 50			
003A 49			
003B 53			

003C 04	0040	DEF	070,'PIS',1,070,029,058
003D 04			
003E 07			
003F 46			
0040 84	0045	DEF	081,'PIS',1,010,029,058
0041 50			
0042 49			
0043 53			
0044 04	0045	DEF	070,'PIS',1,052,3,3
0045 10			
0046 29			
0047 58			
0048 82	0050	DEF	082,'PIS',1,018,027,9
0049 50			
004A 49			
004B 53			
004C 04	0050	DEF	084,'PHE',081,052,042,025
004D 18			
004E 27			
004F 09			
0050 72	0055	DEF	072,'PHE',081,027,043,024
0051 50			
0052 48			
0053 45			
0054 84	0055	DEF	071,'PIS',3,0,034,053
0055 27			
0056 48			
0057 24			
0058 76	0060	DEF	076,'PIS',1,030,015,014
0059 50			
005A 49			
005B 53			
005C 04	0100	DEF	072,'PIS',2,016,033,045
005D 29			
005E 15			
005F 14			
0060 78	0065	DEF	073,'PHE',081,030,049,010
0061 50			
0062 48			
0063 45			
0064 84	0105	DEF	072,'PER',3,0,053,025
0065 20			
0066 49			
0067 10			
0068 78	0070	DEF	07B,'PIS',1,040,5,023
0069 50			
006A 49			
006B 53			
006C 04	0110	DEF	071,'PER',3,6,040,052
006D 40			
006E 05			
006F 23			
0070 70	0075	DEF	07D,'PIS',1,044,9,3
0071 50			
0072 49			
0073 53			
0074 04	0115	DEF	070,'PIS',3,0,04,052
0075 44			
0076 09			
0077 08			

0078	70	0080	DEF	070, 'TRI', 1, 051, 029, 028
0079	54			
007A	52			
007B	49			
007C	04	0120	DEF	070, 'PER', 3, 022, 047, 047
007D	54			
007E	29			
007F	28			
0080	76	0085	DEF	07C, 'PIS', 1, 052, 3, 5
0081	50			
0082	49			
0083	53			
0084	04	0125	DEF	07D, 'TAU', 3, 023, 6, 057
0085	52			
0086	03			
0087	95			
0088	84	0090	DEF	084, 'PHE', 081, 052, 046, 023
0089	50			
008A	48			
008B	45			
008C	84	0130	DEF	07E, 'TAU', 3, 026, 9, 039
008D	52			
008E	46			
008F	23			
0090	74	0095	DEF	071, 'TRI', 2, 8, 034, 053
0091	54			
0092	52			
0093	49			
0094	02	0135	DEF	07F, 'PER', 3, 3, 038, 048
0095	08			
0096	34			
0097	53			
0098	72	0100	DEF	072, 'TRI', 2, 016, 033, 045
0099	54			
009A	52			
009B	49			
009C	02	0140	DEF	080, 'PER', 3, 029, 042, 052
009D	16			
009E	33			
009F	45			
00A0	72	0105	DEF	072, 'PER', 3, 3, 053, 025
00A1	50			
00A2	45			
00A3	52			
00A4	03	0145	DEF	073, 'PER', 3, 041, 047, 043
00A5	03			
00A6	53			
00A7	26			
00A8	74	0110	DEF	071, 'PER', 3, 6, 040, 052
00A9	50			
00AA	45			
00AB	52			
00AC	03	0150	DEF	071, 'PER', 083, 043, 044, 004
00AD	06			
00AE	40			
00AF	53			
00B0	44	0115	DEF	'ALGO', 3, 6, 04, 052
00B1	40			
00B2	47			
00B3	4F			

00B4 03	0115	DEF	076, 'TAU', 3, 045, 034, 037
00B5 06			
00B6 04			
00B7 52			
00B8 70	0120	DEF	070, 'PER', 3, 022, 049, 047
00B9 50			
00BA 45			
00BB 52			
00BC 03	0160	DEF	073, 'PER', 3, 032, 031, 047
00BD 22			
00BE 49			
00BF 47			
00C0 70	0125	DEF	07D, 'TAU', 3, 023, 8, 057
00C1 54			
00C2 44			
00C3 55			
00C4 03	0155	DEF	074, 'PER', 3, 036, 037, 037
00C5 23			
00C6 08			
00C7 57			
00C8 70	0130	DEF	07C, 'TAU', 3, 026, 9, 039
00C9 54			
00CA 44			
00CB 55			
00CC 03	0170	DEF	07E, 'PER', 3, 037, 035, 043
00CD 24			
00CE 09			
00CF 39			
00D0 7F	0135	DEF	07F, 'PER', 3, 3, 038, 045
00D1 50			
00D2 45			
00D3 52			
00D4 03	0175	DEF	071, 'TAU', 3, 059, 010, 025
00D5 03			
00D6 38			
00D7 45			
00D8 90	0140	DEF	080, 'PER', 3, 029, 047, 055
00D9 50			
00DA 45			
00DB 52			
00DC 03	0180	DEF	075, 'TAU', 4, 2, 5, 025
00DD 29			
00DE 47			
00DF 55			
00E0 73	0145	DEF	073, 'PER', 3, 041, 047, 043
00E1 50			
00E2 45			
00E3 52			
00E4 03	0185	DEF	071, 'TAU', 3, 084, 014, 027
00E5 44			
00E6 47			
00E7 43			
00E8 74	0150	DEF	071, 'RET', 083, 043, 064, 051
00E9 52			
00EA 45			
00EB 54			
00EC 03	0190	DEF	071, 'TAU', 3, 084, 014, 027
00ED 43			
00EE 44			
00EF 54			

00F0	74	0155	DEF	076, 'TAU', 3, 046, 024, 2
00F1	54			
00F2	44			
00F3	55			
00F4	03	0195	DEF	072, 'TAU', 4, 018, 013, 037
00F5	44			
00F6	24			
00F7	02			
00F8	75	0160	DEF	075, 'PER', 3, 052, 031, 049
00F9	50			
00FA	45			
00FB	52			
00FC	03	0200	DEF	073, 'TAU', 4, 021, 017, 029
00FD	52			
00FE	34			
00FF	49			
0100	74	0165	DEF	074, 'PER', 3, 056, 039, 057
0101	50			
0102	45			
0103	52			
0104	03	0205	DEF	074, 'TAU', 4, 027, 019, 0
0105	54			
0106	39			
0107	57			
0108	70	0170	DEF	070, 'PER', 3, 057, 035, 043
0109	50			
010A	45			
010B	52			
010C	03	0210	DEF	071, 'TAU', 4, 030, 014, 048
010D	57			
010E	25			
010F	43			
0110	79	0175	DEF	079, 'TAU', 3, 059, 012, 025
0111	54			
0112	41			
0113	55			
0114	03	0215	DEF	070, 'TAU', 4, 034, 016, 028
0115	59			
0116	12			
0117	25			
0118	78	0180	DEF	078, 'TAU', 4, 2, 5, 055
0119	54			
011A	41			
011B	55			
011C	04	0220	DEF	'ALDE' 4, 034, 016, 020
011D	03			
011E	05			
011F	55			
0120	70	0185	DEF	070, 'RET', 084, 014, 062, 031
0121	52			
0122	45			
0123	54			
0124	84	0225	DEF	081, 'TAU', 4, 041, 022, 050
0125	14			
0126	42			
0127	34			
0128	76	0190	DEF	07A, 'TAU', 4, 014, 8, 050
0129	54			
012A	44			
012B	55			

012C	04	0230	DEF	074, 'TAU', 4, 015, 0, 022, 0, 03
012D	14			
012E	08			
012F	50			
0130	72	0195	DEF	072, 'TAU', 4, 018, 015, 034
0131	54			
0132	41			
0133	55			
0134	04	0235	DEF	07A, 'LEP', 085, 012, 016, 013
0135	18			
0136	15			
0137	34			
0139	72	0200	DEF	073, 'TAU', 4, 021, 017, 029
0139	54			
013A	41			
013B	55			
013C	04	0240	DEF	071, 'OST', 085, 013, 2, 013
013D	24			
013E	17			
013F	29			
0140	74	0205	DEF	074, 'TAU', 4, 027, 019, 8
0141	54			
0142	41			
0143	55			
0144	04	0245	DEF	'R16E', 085, 013, 8, 013
0145	27			
0146	19			
0147	08			
0148	7F	0210	DEF	07F, 'TAU', 4, 032, 014, 048
0149	54			
014A	41			
014B	55			
014C	04	0250	DEF	075, 'LEP', 085, 016, 013, 011
014D	32			
014E	14			
014F	38			
0150	70	0215	DEF	070, 'TAU', 4, 034, 016, 028
0151	54			
0152	41			
0153	55			
0154	04	0255	DEF	072, 'OST', 3, 034, 2, 019
0155	34			
0156	16			
0157	28			
0158	41	0220	DEF	'ALDE', 4, 034, 016, 028
0159	4C			
015A	44			
015B	45			
015C	04	0260	DEF	'BELA', 5, 024, 2, 019
015D	24			
015E	16			
015F	28			
0160	91	0225	DEF	081, 'TAU', 4, 041, 022, 055
0161	54			
0162	41			
0163	55			
0164	04	0265	DEF	071, 'TAU', 5, 025, 028, 035
0165	41			
0166	22			
0167	55			

0168 74	0230	DEF	074, 'LEP', 085, 4, 022, 023
0169 40			
016A 45			
016B 50			
016C 95	0230	DEF	071, 'LEP', 085, 027, 020, 046
016D 04			
016E 22			
016F 23			
0170 7A	0235	DEF	07A, 'LEP', 085, 012, 016, 013
0171 40			
0172 45			
0173 50			
0174 95	0275	DEF	073, 'ORI', 085, 030, 0, 018
0175 12			
0176 16			
0177 13			
0178 74	0240	DEF	071, 'ORI', 085, 013, 8, 013
0179 4F			
017A 52			
017B 49			
017C 95	0280	DEF	079, 'LEP', 085, 021, 017, 030
017D 13			
017E 08			
017F 13			
0180 52	0245	DEF	'RIGE', 085, 013, 8, 013
0181 49			
0182 47			
0183 45			
0184 95	0285	DEF	074, 'ORI', 085, 035, 1, 012
0185 13			
0186 08			
0187 13			
0188 79	0250	DEF	079, 'LEP', 085, 018, 013, 011
0189 4C			
018A 45			
018B 50			
018C 95	0290	DEF	075, 'LEP', 5, 036, 021, 7
018D 18			
018E 13			
018F 11			
0190 72	0255	DEF	072, 'ORI', 5, 024, 6, 019
0191 4F			
0192 52			
0193 49			
0194 05	0295	DEF	071, 'LEP', 085, 042, 022, 027
0195 24			
0196 06			
0197 19			
0198 42	0260	DEF	'BELA', 5, 024, 6, 019
0199 45			
019A 4C			
019B 41			
019C 05	0300	DEF	075, 'LEP', 085, 046, 014, 049
019D 24			
019E 06			
019F 19			
01A0 74	0265	DEF	071, 'TAU', 5, 025, 028, 035
01A1 54			
01A2 41			
01A3 55			

01A4 05	0303	DEF	070, 'ORI', 5, 054, 7, 024
01A5 25			
01A6 39			
01A7 35			
01A8 71	0270	DEF	071, 'LEP', 085, 027, 020, 046
01A9 40			
01AA 45			
01AB 50			
01AC 95	0310	DEF	'REI', 5, 054, 7, 024
01AD 27			
01AE 20			
01AF 46			
01B0 73	0275	DEF	073, 'ORI', 085, 030, 0, 018
01B1 4F			
01B2 52			
01B3 49			
01B4 95	0315	DEF	074, 'LEP', 085, 055, 014, 050
01B5 30			
01B6 00			
01B7 19			
01B8 70	0280	DEF	070, 'LEP', 085, 031, 017, 050
01B9 40			
01BA 45			
01BB 50			
01BC 95	0320	DEF	078, 'ORI', 6, 6, 014, 046
01BD 34			
01BE 17			
01BF 50			
01C0 74	0285	DEF	074, 'ORI', 085, 035, 1, 012
01C1 4F			
01C2 52			
01C3 49			
01C4 95	0325	DEF	070, 'REI', 085, 010, 074, 044
01C5 35			
01C6 04			
01C7 12			
01C8 75	0290	DEF	075, 'TAU', 5, 036, 021, 7
01C9 54			
01CA 44			
01CB 55			
01CC 95	0330	DEF	074, 'NON', 6, 022, 4, 036
01CD 36			
01CE 24			
01CF 07			
01D0 72	0295	DEF	072, 'LEP', 085, 043, 022, 027
01D1 40			
01D2 45			
01D3 50			
01D4 95	0335	DEF	078, 'FUP', 085, 037, 043, 010
01D5 43			
01D6 23			
01D7 27			
01D8 75	0300	DEF	075, 'LEP', 085, 046, 014, 049
01D9 40			
01DA 45			
01DB 50			
01DC 95	0340	DEF	075, 'LEP', 085, 030, 020, 052
01DD 46			
01DE 14			
01DF 49			

01E0	20	0305	DEF	070, 'ORI', 5, 054, 7, 024
01E1	4E			
01E2	52			
01E3	49			
01E4	05	0345	DEF	073, 'PIC', 066, 9, 054, 037
01E5	54			
01E6	07			
01E7	24			
01E8	42	0310	DEF	'BETE', 5, 054, 7, 024
01E9	45			
01EA	54			
01EB	45			
01EC	05	0350	DEF	070, 'PIC', 066, 047, 061, 054
01ED	54			
01EE	07			
01EF	24			
01F0	74	0315	DEF	076, 'LEP', 085, 055, 014, 010
01F1	40			
01F2	45			
01F3	50			
01F4	95	0355	DEF	081, 'PUP', 086, 047, 030, 085
01F5	55			
01F6	44			
01F7	40			
01F8	78	0320	DEF	078, 'ORI', 6, 6, 014, 046
01F9	4F			
01FA	52			
01FB	49			
01FC	06	0360	DEF	073, 'MON', 067, 010, 0, 027
01FD	06			
01FE	44			
01FF	44			
0200	70	0325	DEF	070, 'MEN', 086, 010, 074, 044
0201	4D			
0202	45			
0203	4E			
0204	86	0355	DEF	071, 'PUP', 087, 016, 037, 0
0205	40			
0206	74			
0207	44			
0208	74	0330	DEF	074, 'MON', 6, 022, 4, 036
0209	4D			
020A	4F			
020B	4E			
020C	06	0370	DEF	073, 'VOL', 087, 016, 087, 055
020D	23			
020E	04			
020F	36			
0210	78	0335	DEF	078, 'PUP', 086, 037, 043, 010
0211	50			
0212	55			
0213	50			
0214	86	0375	DEF	080, 'PUP', 087, 030, 043, 015
0215	37			
0216	43			
0217	40			
0218	73	0340	DEF	073, 'LEP', 085, 050, 020, 052
0219	40			
021A	45			
021B	50			

021C	85	0303	DEF	070,'MON',087,040,050
021D	50			
021E	20			
021F	52			
0220	73	0345	DEF	073,'PIC',086,9,054,057
0221	50			
0222	49			
0223	43			
0224	84	0385	DEF	075,'VOL',087,042,072,033
0225	09			
0226	54			
0227	57			
0228	70	0350	DEF	070,'PIC',086,047,061,054
0229	50			
022A	49			
022B	43			
022C	84	0390	DEF	07C,'PUP',087,045,074,040
022D	47			
022E	41			
022F	54			
0230	81	0355	DEF	081,'PUP',086,049,050,035
0231	50			
0232	55			
0233	50			
0234	84	0393	DEF	075,'PUP',088,2,039,056
0235	49			
0236	50			
0237	35			
0238	73	0360	DEF	073,'MON',087,010,0,027
0239	40			
023A	4F			
023B	4E			
023C	87	0400	DEF	07E,'PUP',088,5,024,014
023D	10			
023E	00			
023F	27			
0240	7E	0365	DEF	07E,'PUP',087,016,037,3
0241	50			
0242	55			
0243	50			
0244	87	0405	DEF	072,'VOL',088,8,047,012
0245	14			
0246	37			
0247	03			
0248	73	0370	DEF	073,'VOL',087,016,067,055
0249	53			
024A	4F			
024B	46			
024C	87	0410	DEF	071,'VOL',086,035,041,4
024D	14			
024E	47			
024F	55			
0250	90	0375	DEF	080,'PUP',087,028,043,015
0251	50			
0252	55			
0253	50			
0254	87	0415	DEF	070,'VOL',086,030,040,040
0255	28			
0256	43			
0257	15			

0258	70	0380	DEF	070, 'MON', 087, 040, 9, 030
0259	40			
025A	4F			
025B	4E			
025C	87	0420	DEF	070, 'VEL', 088, 039, 052, 050
025D	40			
025E	09			
025F	30			
0260	75	0385	DEF	075, 'VOL', 087, 042, 072, 033
0261	56			
0262	4F			
0263	40			
0264	87	0425	DEF	070, 'PYX', 088, 040, 033, 0
0265	42			
0266	72			
0267	33			
0268	70	0390	DEF	070, 'PUP', 087, 048, 024, 048
0269	50			
026A	55			
026B	50			
026C	87	0430	DEF	075, 'PYX', 088, 049, 027, 050
026D	48			
026E	24			
026F	48			
0270	75	0395	DEF	075, 'PUP', 088, 2, 039, 056
0271	50			
0272	55			
0273	50			
0274	88	0435	DEF	070, 'VOL', 089, 0, 066, 018
0275	02			
0276	39			
0277	56			
0278	7F	0400	DEF	07F, 'PUP', 088, 6, 024, 014
0279	50			
027A	55			
027B	50			
027C	88	0440	DEF	075, 'VEL', 089, 7, 043, 020
027D	06			
027E	24			
027F	14			
0280	73	0405	DEF	072, 'VEL', 088, 8, 047, 016
0281	56			
0282	45			
0283	40			
0284	88	0445	DEF	070, 'LYN', 9, 019, 024, 028
0285	08			
0286	47			
0287	16			
0288	74	0410	DEF	071, 'VOL', 088, 025, 066, 4
0289	56			
028A	4F			
028B	40			
028C	88	0450	DEF	073, 'PYX', 089, 020, 025, 052
028D	25			
028E	66			
028F	04			
0290	70	0415	DEF	07D, 'UMA', 8, 028, 060, 046
0291	55			
0292	40			
0293	44			

0294	08	0420	DEF	076, 'VEL', 089, 021, 054, 055
0295	28			
0296	30			
0297	46			
0298	79	0420	DEF	070, 'VEL', 088, 039, 052, 050
0299	56			
029A	45			
029B	40			
029C	88	0460	DEF	072, 'URA', 9, 021, 051, 045
029D	39			
029E	52			
029F	50			
02A0	70	0425	DEF	070, 'PYX', 088, 042, 033, 6
02A1	50			
02A2	59			
02A3	58			
02A4	88	0465	DEF	070, 'LEO', 9, 040, 9, 050
02A5	42			
02A6	33			
02A7	06			
02A8	72	0430	DEF	072, 'PYX', 088, 049, 027, 038
02A9	50			
02AA	59			
02AB	58			
02AC	88	0470	DEF	074, 'LEO', 9, 044, 023, 051
02AD	49			
02AE	27			
02AF	38			
02B0	70	0435	DEF	070, 'VOL', 089, 2, 066, 018
02B1	56			
02B2	4E			
02B3	40			
02B4	89	0475	DEF	082, 'URA', 9, 043, 054, 7
02B5	02			
02B6	66			
02B7	19			
02B8	79	0440	DEF	079, 'VEL', 089, 7, 043, 020
02B9	56			
02BA	45			
02BB	40			
02BC	89	0480	DEF	076, 'LEO', 9, 021, 026, 5
02BD	07			
02BE	43			
02BF	20			
02C0	70	0445	DEF	070, 'LYN', 9, 019, 034, 028
02C1	40			
02C2	59			
02C3	4E			
02C4	89	0485	DEF	083, 'VEL', 089, 056, 054, 028
02C5	19			
02C6	34			
02C7	28			
02C8	77	0450	DEF	077, 'PYX', 089, 020, 025, 052
02C9	50			
02CA	59			
02CB	58			
02CC	89	0490	DEF	071, 'LEO', 9, 059, 8, 8
02CD	20			
02CE	25			
02CF	52			

02D0	78	0455	DEF	078, 'VEL', 089, 021, 054, 055
02D1	56			
02D2	45			
02D3	40			
02D4	89	0493	DEF	076, 'LE0', 010, 2, 016, 051
02D5	24			
02D6	54			
02D7	55			
02D8	77	0460	DEF	077, 'UMA', 9, 031, 051, 045
02D9	55			
02DA	40			
02DB	44			
02DC	89	0500	DEF	075, 'LE0', 010, 7, 012, 3
02DD	34			
02DE	54			
02DF	45			
02E0	70	0465	DEF	07D, 'LE0', 9, 040, 9, 058
02E1	40			
02E2	45			
02E3	4F			
02E4	09	0505	DEF	'LE0', 010, 7, 012, 3
02E5	40			
02E6	09			
02E7	58			
02E8	74	0470	DEF	074, 'LE0', 9, 044, 023, 051
02E9	40			
02EA	45			
02EB	4F			
02EC	09	0510	DEF	075, 'LE0', 010, 015, 023, 030
02ED	44			
02EE	28			
02EF	54			
02F0	82	0475	DEF	082, 'UMA', 9, 049, 059, 7
02F1	55			
02F2	40			
02F3	44			
02F4	09	0515	DEF	071, 'LE0', 010, 026, 036, 048
02F5	49			
02F6	59			
02F7	07			
02F8	7A	0480	DEF	07A, 'LE0', 9, 051, 026, 5
02F9	40			
02FA	45			
02FB	4F			
02FC	09	0520	DEF	07F, 'LE0', 010, 031, 9, 024
02FD	54			
02FE	26			
02FF	05			
0300	83	0485	DEF	083, 'VEL', 089, 056, 054, 028
0301	56			
0302	45			
0303	40			
0304	89	0525	DEF	084, 'UMA', 011, 6, 044, 035
0305	56			
0306	54			
0307	28			
0308	7E	0490	DEF	07E, 'LE0', 9, 059, 8, 8
0309	40			
030A	45			
030B	4F			

030C 09	0340	DEF	072, 'LE0', 011, 013, 023, 027
030D 59			
030E 08			
030F 08			
0310 74	0495	DEF	076, 'LE0', 010, 6, 016, 051
0311 4C			
0312 45			
0313 4F			
0314 10	0535	DEF	077, 'LE0', 011, 013, 015, 031
0315 06			
0316 16			
0317 54			
0318 70	0500	DEF	070, 'LE0', 010, 7, 012, 3
0319 4C			
031A 45			
031B 4F			
031C 10	0540	DEF	085, 'LE0', 091, 013, 2, 032
031D 07			
031E 12			
031F 08			
0320 52	0505	DEF	'REGU', 010, 7, 012, 3
0321 45			
0322 47			
0323 55			
0324 10	0545	DEF	078, 'UMA', 011, 017, 033, 031
0325 07			
0326 12			
0327 03			
0328 75	0510	DEF	075, 'LE0', 010, 015, 023, 030
0329 4C			
032A 45			
032B 4F			
032C 10	0550	DEF	080, 'LE0', 011, 020, 2, 03
032D 45			
032E 28			
032F 30			
0330 74	0515	DEF	071, 'LMI', 010, 026, 036, 048
0331 4C			
0332 4D			
0333 49			
0334 10	0555	DEF	081, 'LE0', 011, 026, 2, 037
0335 26			
0336 36			
0337 49			
0338 7F	0520	DEF	07F, 'LE0', 010, 031, 9, 024
0339 4C			
033A 45			
033B 4F			
033C 10	0560	DEF	082, 'LE0', 091, 035, 0, 042
033D 34			
033E 09			
033F 24			
0340 84	0525	DEF	084, 'UMA', 011, 8, 044, 035
0341 55			
0342 4D			
0343 44			
0344 14	0565	DEF	075, 'MUS', 091, 046, 056, 036
0345 08			
0346 44			
0347 35			

0348 73	0530	DEF	073, 'LE0', 011, 013, 020, 037
0349 4C			
034A 45			
034B 4F			
034C 11	0570	DEF	078, 'VIE', 011, 044, 6, 039
034D 13			
034E 29			
034F 37			
0350 77	0535	DEF	077, 'LE0', 011, 013, 015, 031
0351 4C			
0352 45			
0353 4F			
0354 11	0575	DEF	075, 'LE0', 011, 048, 016, 042
0355 13			
0356 15			
0357 31			
0358 93	0540	DEF	083, 'LE0', 091, 015, 3, 032
0359 4C			
035A 45			
035B 4F			
035C 91	0580	DEF	086, 'LE0', 011, 050, 014, 040
035D 15			
035E 03			
035F 32			
0360 79	0545	DEF	078, 'UMA', 011, 017, 033, 011
0361 55			
0362 4D			
0363 41			
0364 11	0585	DEF	079, 'VIE', 011, 049, 01, 036
0365 17			
0366 33			
0367 11			
0368 90	0550	DEF	080, 'LE0', 011, 020, 6, 8
0369 4C			
036A 45			
036B 4F			
036C 11	0590	DEF	076, 'VIE', 011, 059, 6, 048
036D 20			
036E 06			
036F 08			
0370 91	0555	DEF	081, 'LE0', 011, 026, 2, 057
0371 4C			
0372 45			
0373 4F			
0374 11	0595	DEF	070, 'VIE', 012, 4, 8, 050
0375 26			
0376 02			
0377 57			
0378 92	0560	DEF	082, 'LE0', 091, 035, 0, 042
0379 4C			
037A 45			
037B 4F			
037C 91	0600	DEF	073, 'DHA', 012, 014, 057, 8
037D 35			
037E 00			
037F 42			
0380 79	0565	DEF	079, 'MUS', 091, 044, 066, 036
0381 4D			
0382 55			
0383 53			

0384	94	0570	DEF	073, 'VIR', 010, 010, 010, 010
0385	44			
0386	46			
0387	36			
0388	78	0570	DEF	07B, 'VIR', 011, 044, 6, 038
0389	56			
038A	49			
038B	52			
038C	14	0610	DEF	072, 'MUS', 092, 031, 072, 0
038D	44			
038E	06			
038F	39			
0390	74	0575	DEF	071, 'LEO', 011, 048, 014, 040
0391	40			
0392	45			
0393	4F			
0394	14	0615	DEF	070, 'MUS', 092, 035, 069, 01
0395	48			
0396	14			
0397	40			
0398	44	0580	DEF	'DENE', 011, 048, 014, 040
0399	45			
039A	4E			
039B	45			
039C	14	0620	DEF	07F, 'VIR', 012, 040, 010, 030
039D	48			
039E	14			
039F	40			
03A0	74	0585	DEF	071, 'VIR', 011, 049, 01, 052
03A1	56			
03A2	49			
03A3	52			
03A4	14	0625	DEF	074, 'UMA', 012, 053, 056, 3
03A5	49			
03A6	04			
03A7	52			
03A8	75	0590	DEF	07E, 'VIR', 011, 059, 6, 043
03A9	56			
03AA	49			
03AB	52			
03AC	14	0630	DEF	075, 'VIR', 012, 054, 3, 030
03AD	59			
03AE	06			
03AF	43			
03B0	70	0595	DEF	07D, 'VIR', 012, 4, 8, 050
03B1	56			
03B2	49			
03B3	52			
03B4	12	0635	DEF	075, 'MUS', 092, 0, 071, 026
03B5	04			
03B6	08			
03B7	59			
03B8	73	0600	DEF	073, 'UMA', 012, 014, 057, 8
03B9	55			
03BA	4D			
03BB	44			
03BC	13	0640	DEF	074, 'VIR', 013, 01, 011, 03
03BD	14			
03BE	57			
03BF	08			

03C0	76	0605	DEF	076,'VIR',092,018,0,033
03C1	56			
03C2	49			
03C3	52			
03C4	92	0605	DEF	077,'VIR',093,018,0,033
03C5	18			
03C6	00			
03C7	33			
03C8	72	0610	DEF	072,'MUS',092,031,072,0
03C9	40			
03CA	55			
03CB	52			
03CC	92	0650	DEF	075,'UMA',013,023,055,1
03CD	24			
03CE	72			
03CF	00			
03D0	70	0615	DEF	070,'MUS',092,035,069,01
03D1	40			
03D2	55			
03D3	52			
03D4	92	0655	DEF	070,'VIR',093,024,011,3
03D5	35			
03D6	69			
03D7	04			
03D8	7F	0620	DEF	07F,'VIR',012,040,010,020
03D9	56			
03DA	49			
03DB	52			
03DC	12	0660	DEF	073,'VIR',093,026,011,3
03DD	40			
03DE	10			
03DF	20			
03E0	74	0625	DEF	074,'UMA',012,053,056,3
03E1	55			
03E2	40			
03E3	41			
03E4	12	0665	DEF	075,'VIR',093,053,0,075
03E5	52			
03E6	56			
03E7	03			
03E8	72	0630	DEF	073,'VIR',012,054,3,030
03E9	56			
03EA	49			
03EB	52			
03EC	12	0670	DEF	076,'UMA',013,046,049,024
03ED	54			
03EE	03			
03EF	30			
03F0	72	0635	DEF	073,'MUS',093,0,071,026
03F1	40			
03F2	55			
03F3	53			
03F4	92	0675	DEF	081,'VIR',014,0,1,030
03F5	00			
03F6	71			
03F7	26			
03F8	74	0640	DEF	074,'VIR',013,01,011,03
03F9	56			
03FA	49			
03FB	52			

02FC	18		DEF	071, 'VIR', 094, 078, 013
02FD	01			
02FE	11			
02FF	03			
0400	77	0645	DEF	077, 'VIR', 083, 8, 5, 025
0401	56			
0402	49			
0403	52	0655	DEF	070, 'LUP', 095, 040, 047, 017
0404	93			
0405	09			
0406	05			
0407	25			
0408	75	0650	DEF	075, 'UMA', 013, 023, 055, 1
0409	55			
040A	40			
040B	41	0690	DEF	076, 'VIR', 096, 041, 05, 036
040C	12			
040D	23			
040E	55			
040F	01			
0410	70	0655	DEF	070, 'VIR', 093, 024, 011, 3
0411	56			
0412	49			
0413	52	0695	DEF	071, 'UMI', 014, 020, 074, 013
0414	93			
0415	24			
0416	11			
0417	03			
0418	53	0660	DEF	'SPIC', 093, 024, 011, 3
0419	50			
041A	49			
041B	43	0700	DEF	071, 'LUP', 094, 037, 043, 02
041C	93			
041D	24			
041E	11			
041F	03			
0420	75	0665	DEF	075, 'VIR', 093, 033, 0, 029
0421	56			
0422	49			
0423	52	0705	DEF	060, 'LIR', 095, 2, 028, 012
0424	93			
0425	33			
0426	00			
0427	39			
0428	76	0670	DEF	076, 'UMA', 013, 046, 049, 024
0429	55			
042A	40			
042B	41	0710	DEF	075, 'LUP', 095, 010, 052, 1
042C	13			
042D	46			
042E	49			
042F	24			
0430	91	0675	DEF	081, 'VIR', 014, 0, 1, 038
0431	56			
0432	49			
0433	52	0715	DEF	071, 'LIR', 095, 013, 09, 018
0434	14			
0435	00			
0436	04			
0437	38			

0438 79	0680	DEF	079, 'VIR', 094, 018, 013
0439 56			
043A 49			
043B 52	0720	DEF	072, 'TRA', 095, 016, 068, 036
043C 94			
043D 19			
043E 13			
043F 70	0685	DEF	070, 'LUP', 094, 040, 047, 017
0440 40			
0441 55			
0442 50			
0443 94	0725	DEF	072, 'UMI', 015, 020, 071, 093
0444 40			
0445 47			
0446 17			
0447 76	0690	DEF	07A, 'VIR', 094, 041, 05, 034
0448 56			
0449 49			
044A 52			
044B 94	0730	DEF	073, 'LIB', 095, 034, 014, 043
044C 44			
044D 05			
044E 34			
044F 74	0695	DEF	071, 'UMI', 014, 050, 074, 013
0450 55			
0451 40			
0452 49			
0453 14	0735	DEF	082, 'LIB', 095, 035, 040, 3
0454 50			
0455 74			
0456 13			
0457 74	0700	DEF	071, 'LUP', 094, 057, 043, 02
0458 40			
0459 55			
045A 50			
045B 94	0740	DEF	073, 'SER', 015, 045, 013, 028
045C 57			
045D 43			
045E 02			
045F 80	0705	DEF	080, 'LIB', 095, 2, 025, 012
0460 40			
0461 49			
0462 43			
0463 95	0745	DEF	07A, 'SER', 095, 048, 3, 020
0464 03			
0465 25			
0466 13			
0467 75	0710	DEF	075, 'LUP', 095, 010, 052, 1
0468 40			
0469 55			
046A 50			
046B 95	0750	DEF	074, 'SER', 015, 045, 4, 022
046C 10			
046D 52			
046E 04			
046F 74	0715	DEF	071, 'LIB', 095, 015, 09, 018
0470 40			
0471 49			
0472 42			
0473 95	0755	DEF	071, 'TRA', 095, 05, 068, 037

0474	15			
0475	09			
0476	18			
0477	72	0720	DEF	072, 'TRA', 095, 016, 068, 036
0478	54			
0479	52			
047A	14			
047B	95	0760	DEF	072, 'SER', 018, 058, 043, 043
047C	16			
047D	68			
047E	36			
047F	72	0725	DEF	072, 'UMI', 015, 020, 071, 053
0480	55			
0481	40			
0482	49			
0483	15	0765	DEF	072, 'SCO', 095, 057, 026, 3
0484	20			
0485	71			
0486	52			
0487	72	0730	DEF	072, 'LIB', 095, 034, 014, 043
0488	60			
0489	49			
048A	42			
048B	95	0770	DEF	073, 'SCO', 095, 054, 002, 002
048C	34			
048D	14			
048E	43			
048F	82	0735	DEF	082, 'LIB', 095, 035, 028, 3
0490	60			
0491	49			
0492	42			
0493	95	0775	DEF	071, 'SCO', 096, 4, 019, 044
0494	35			
0495	28			
0496	03			
0497	71	0740	DEF	071, 'SER', 015, 045, 015, 028
0498	53			
0499	45			
049A	52			
049B	15	0780	DEF	072, 'LUP', 096, 3, 036, 044
049C	45			
049D	15			
049E	28			
049F	7A	0745	DEF	07A, 'SER', 095, 048, 3, 022
04A0	53			
04A1	45			
04A2	53			
04A3	95	0785	DEF	073, 'SPH', 096, 013, 3, 038
04A4	48			
04A5	03			
04A6	23			
04A7	74	0750	DEF	074, 'SER', 015, 049, 4, 032
04A8	53			
04A9	45			
04AA	52			
04AB	15	0790	DEF	073, 'TRA', 096, 013, 066, 067
04AC	49			
04AD	04			
04AE	32			
04AF	74	0755	DEF	071, 'TRA', 095, 053, 063, 021

04B0	54		
04B1	52		
04B2	44		
04B3	95	0753	DEF 074, 'OPH', 096, 017, 4, 0, 05
04B4	52		
04B5	53		
04B6	24		
04B7	73	0760	DEF 072, 'SER', 015, 055, 015, 043
04B8	53		
04B9	45		
04BA	52		
04BB	45	0800	DEF 080, 'SCO', 096, 019, 023, 032
04BC	55		
04BD	45		
04BE	43		
04BF	7E	0765	DEF 07E, 'SCO', 095, 057, 026, 3
04C0	53		
04C1	43		
04C2	4F		
04C3	95	0805	DEF 080, 'SER', 016, 021, 1, 04
04C4	57		
04C5	26		
04C6	03		
04C7	73	0770	DEF 073, 'SCO', 095, 059, 022, 033
04C8	53		
04C9	43		
04CA	4F		
04CB	95	0810	DEF 076, 'SCO', 096, 020, 026, 032
04CC	59		
04CD	22		
04CE	33		
04CF	74	0775	DEF 071, 'SCO', 096, 4, 019, 044
04D0	53		
04D1	43		
04D2	4F		
04D3	96	0815	DEF 081, 'ANTA', 096, 020, 025, 023
04D4	04		
04D5	19		
04D6	44		
04D7	77	0780	DEF 077, 'LUP', 096, 5, 036, 044
04D8	4C		
04D9	55		
04DA	50		
04DB	96	0820	DEF 081, 'SCO', 096, 036, 020, 010
04DC	05		
04DD	36		
04DE	44		
04DF	73	0785	DEF 073, 'OPH', 096, 013, 3, 038
04E0	4F		
04E1	50		
04E2	48		
04E3	96	0825	DEF 075, 'OPH', 096, 035, 010, 031
04E4	13		
04E5	03		
04E6	38		
04E7	73	0790	DEF 073, 'TRA', 096, 013, 063, 037
04E8	54		
04E9	52		
04EA	41		
04EB	96	0830	DEF 078, 'TRA', 096, 041, 042, 047

04EC	13		
04ED	63		
04EE	37		
04EF	74	0795	DEF 074,'OPH',096,017,4,038
04F0	4F		
04F1	50		
04F2	48		
04F3	96	0825	DEF 074,'OPH',096,017,4,038
04F4	17		
04F5	04		
04F6	38		
04F7	80	0800	DEF 080,'SCO',096,019,025,032
04F8	53		
04F9	43		
04FA	4F		
04FB	96	0840	DEF 074,'OPH',096,017,4,038
04FC	19		
04FD	25		
04FE	32		
04FF	80	0805	DEF 080,'SER',016,021,1,04
0500	53		
0501	45		
0502	52		
0503	14	0845	DEF 074,'OPH',096,017,4,038
0504	24		
0505	04		
0506	04		
0507	70	0810	DEF 070,'SCO',096,028,026,023
0508	53		
0509	43		
050A	4F		
050B	96	0820	DEF 081,'SCO',096,034,028,010
050C	28		
050D	26		
050E	23		
050F	44	0815	DEF 'ANTA',096,028,026,023
0510	4E		
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0512	44		
0513	96	0850	DEF 070,'SCO',096,028,026,023
0514	28		
0515	26		
0516	23		
0517	81	0820	DEF 081,'SCO',096,034,028,010
0518	53		
0519	43		
051A	4F		
051B	96	0840	DEF 074,'OPH',096,017,4,038
051C	34		
051D	28		
051E	10		
051F	75	0825	DEF 075,'OPH',096,036,010,031
0520	4F		
0521	50		
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0523	96	0845	DEF 074,'OPH',096,017,4,038
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0525	10		
0526	34		
0527	70	0830	DEF 070,'TRA',096,046,068,059

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052A	41		
052B	94		
052C	46		
052D	69		
052E	59		
052F	74	0835	DEF 074, 'SC0', 016, 048, 034, 015
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0531	43		
0532	4F		
0533	14		
0534	49		
0535	34		
0536	15		
0537	76	0840	DEF 076, 'SC0', 097, 010, 043, 012
0538	53		
0539	43		
053A	4E		
053B	97		
053C	10		
053D	43		
053E	12		
053F	77	0845	DEF 077, 'OPH', 097, 020, 024, 058
0540	4F		
0541	50		
0542	49		
0543	97		
0544	20		
0545	34		
0546	58		
0547	99	0850	DEF 080, 'OPH', 017, 025, 4, 9
0548	4F		
0549	50		
054A	49		
054B	17		
054C	25		
054D	04		
054E	09		
054F	92	0855	DEF 082, 'SC0', 097, 029, 037, 016
0550	53		
0551	43		
0552	4F		
0553	97		
0554	29		
0555	37		
0556	14		
0557	79	0860	DEF 079, 'SC0', 097, 032, 037, 5
0558	53		
0559	43		
055A	4F		
055B	97		
055C	33		
055D	37		
055E	05		
055F	79	0865	DEF 070, 'OPH', 017, 033, 012, 034
0560	4F		
0561	50		
0562	49		
0563	17		

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0565	42				
0566	34				
0567	77	0870	DEF	077, 'SCO', 097, 035, 042, 058	
0568	53				
0569	43				
056A	4F				
056B	97	0910	DEF	078, 'SCO', 098, 036, 043, 059	
056C	35				
056D	42				
056E	59				
056F	70	0875	DEF	070, 'SER', 097, 036, 015, 023	
0570	53				
0571	45				
0572	52				
0573	97	0915	DEF	072, 'SER', 098, 017, 020, 026	
0574	36				
0575	45				
0576	23				
0577	74	0880	DEF	071, 'OPH', 017, 042, 4, 034	
0578	4F				
0579	50				
057A	49				
057B	47	0920	DEF	074, 'SER', 098, 020, 2, 028	
057C	43				
057D	04				
057E	34				
057F	76	0885	DEF	076, 'PAV', 097, 043, 064, 042	
0580	50				
0581	44				
0582	56				
0583	97	0925	DEF	075, 'PAV', 098, 021, 061, 047	
0584	43				
0585	44				
0586	42				
0587	72	0890	DEF	072, 'OPH', 017, 046, 2, 042	
0588	4F				
0589	50				
058A	49				
058B	47	0930	DEF	074, 'SER', 098, 022, 034, 023	
058C	46				
058D	02				
058E	42				
058F	79	0895	DEF	07B, 'OPH', 097, 057, 9, 046	
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0591	50				
0592	49				
0593	97	0935	DEF	070, 'TAL', 098, 025, 045, 020	
0594	57				
0595	09				
0596	46				
0597	72	0900	DEF	072, 'SGR', 098, 4, 030, 025	
0598	53				
0599	47				
059A	52				
059B	99	0940	DEF	079, 'SGR', 098, 026, 025, 023	
059C	04				
059D	30				
059E	25				
059F	7A	0905	DEF	07A, 'SGR', 098, 012, 021, 3	

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05A1	47			
05A2	52			
05A3	99	0940		
05A4	42			
05A5	24			
05A6	03			
05A7	76	0910	DEF	076, 'SGR', 098, 016, 036, 045
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05A9	47			
05AA	52			
05AB	99	0950		
05AC	43			
05AD	36			
05AE	45			
05AF	73	0915	DEF	073, 'SGR', 098, 019, 029, 050
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05B1	47			
05B2	52			
05B3	99	0955		
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05B5	29			
05B6	50			
05B7	76	0920	DEF	076, 'SER', 098, 020, 2, 054
05B8	53			
05B9	45			
05BA	52			
05BB	99	0960		
05BC	29			
05BD	03			
05BE	54			
05BF	70	0925	DEF	070, 'PAV', 098, 021, 061, 029
05C0	50			
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05C2	56			
05C3	99	0965		
05C4	24			
05C5	64			
05C6	29			
05C7	74	0930	DEF	074, 'SGR', 098, 022, 034, 023
05C8	53			
05C9	47			
05CA	52			
05CB	99	0970		
05CC	22			
05CD	34			
05CE	23			
05CF	70	0935	DEF	070, 'TEL', 098, 025, 045, 058
05D0	54			
05D1	45			
05D2	40			
05D3	99	0975		
05D4	25			
05D5	45			
05D6	59			
05D7	79	0940	DEF	079, 'SGR', 098, 026, 025, 025
05D8	53			
05D9	47			
05DA	52			
05DB	99	0980		

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0500	25		
050E	25		
050F	72	0945	DEF 072, 'SCT', 098, 028, 014, 034
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05E2	54		
05E3	98	0950	DEF 073, 'SCT', 098, 034, 8, 015
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05E5	14		
05E6	34		
05E7	70	0950	DEF 070, 'SCT', 098, 034, 8, 015
05E8	53		
05E9	43		
05EA	54		
05EB	98	0950	DEF 070, 'SCT', 098, 034, 8, 015
05EC	34		
05ED	09		
05EE	15		
05EF	70	0955	DEF 070, 'LYR', 018, 036, 038, 045
05F0	40		
05F1	59		
05F2	52		
05F3	19	0955	DEF 072, 'SCT', 018, 022, 4, 010
05F4	36		
05F5	39		
05F6	45		
05F7	56	0960	DEF 'VEGA', 018, 036, 038, 045
05F8	45		
05F9	47		
05FA	44		
05FB	19	1000	DEF 072, 'LYR', 018, 036, 038, 045
05FC	36		
05FD	38		
05FE	45		
05FF	75	0965	DEF 075, 'PAV', 098, 040, 071, 026
0600	50		
0601	44		
0602	56		
0603	98	1005	DEF 076, 'SGR', 099, 013, 025, 3
0604	40		
0605	74		
0606	26		
0607	72	0970	DEF 073, 'SCT', 098, 041, 9, 4
0608	53		
0609	43		
060A	54		
060B	98	1010	DEF 077, 'LYR', 099, 013, 025, 3
060C	44		
060D	09		
060E	04		
060F	93	0975	DEF 083, 'SGR', 098, 044, 027, 0
0610	53		
0611	47		
0612	52		
0613	98	1015	DEF 078, 'SGR', 099, 022, 040, 033
0614	44		
0615	27		
0616	00		
0617	74	0980	DEF 071, 'LYR', 018, 049, 033, 020

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0419	59		
041A	52		
041B	18	1030	
041C	49		
041D	33		
041E	20		
041F	79	0985	DEF 079, 'PAV', 098, 050, 062, 012
0420	50		
0421	41		
0422	56		
0423	98	1025	DEF 072, 'SOT', 019, 046, 018, 028
0424	50		
0425	42		
0426	42		
0427	80	0990	DEF 080, 'SGR', 098, 053, 026, 019
0428	53		
0429	47		
042A	52		
0429	98	1030	DEF 076, 'SOT', 019, 051, 015, 078
042C	53		
042D	26		
042E	19		
042F	77	0995	DEF 077, 'SER', 018, 055, 4, 010
0430	53		
0431	45		
0432	52		
0433	18	1035	DEF 074, 'PAV', 095, 058, 072, 032
0434	55		
0435	04		
0436	10		
0437	73	1000	DEF 072, 'LYR', 018, 058, 032, 039
0438	40		
0439	59		
043A	52		
0438	18	1040	DEF 073, 'PAV', 096, 024, 066, 017
043C	58		
043D	32		
043E	39		
043F	75	1005	DEF 07E, 'SGR', 099, 8, 021, 3
0440	52		
0441	47		
0442	52		
0443	99	1045	DEF 07D, 'PAV', 090, 024, 036, 017
0444	08		
0445	21		
0446	03		
0447	77	1010	DEF 077, 'LYR', 099, 015, 038, 5
0448	40		
0449	59		
044A	52		
044B	99	1050	DEF 07D, 'IND', 090, 036, 047, 027
044C	15		
044D	38		
044E	05		
044F	78	1015	DEF 070, 'SGR', 099, 022, 040, 039
0450	52		
0451	47		
0452	52		
0453	99	1055	DEF 071, 'PAV', 090, 053, 040, 016

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0657	74	1020	DEF 071, 'SGT', 019, 040, 017, 025
0658	53		
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065A	54		
065B	19	1020	DEF 072, 'IND', 040, 020, 020, 021
065C	40		
065D	17		
065E	25		
065F	73	1025	DEF 073, 'SGT', 019, 046, 018, 028
0660	53		
0661	47		
0662	54		
0663	19	1025	DEF 074, 'SGT', 041, 02, 027, 025
0664	46		
0665	19		
0666	28		
0667	72	1030	DEF 072, 'SGT', 019, 057, 019, 026
0668	53		
0669	47		
066A	54		
066B	19	1030	DEF 075, 'PAV', 041, 024, 025, 027
066C	57		
066D	19		
066E	26		
066F	74	1035	DEF 074, 'PAV', 099, 058, 072, 057
0670	50		
0671	41		
0672	56		
0673	99	1035	DEF 075, 'SGT', 041, 031, 027, 028
0674	58		
0675	72		
0676	57		
0677	73	1040	DEF 073, 'PAV', 0A0, 6, 066, 013
0678	50		
0679	41		
067A	56		
067B	10	1040	DEF 074, 'FEB', 021, 043, 7, 062
067C	06		
067D	66		
067E	13		
067F	70	1045	DEF 070, 'PAV', 0A0, 024, 056, 047
0680	50		
0681	41		
0682	56		
0683	10	1045	DEF 074, 'IND', 0A2, 1, 056, 051
0684	24		
0685	56		
0686	47		
0687	70	1050	DEF 070, 'IND', 0A0, 036, 047, 021
0688	49		
0689	4E		
068A	44		
068B	10	1050	DEF 07A, 'PSA', 0A2, 7, 033, 6
068C	36		
068D	47		
068E	21		
068F	71	1055	DEF 071, 'PAV', 0A0, 043, 066, 016

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0691	44		
0692	56		
0693	AD	1095	DEF 07E,'IND',0A0,053,058,031
0694	43		
0695	66		
0696	46		
0697	74	1060	DEF 071,'IND',0A0,053,058,031
0698	49		
0699	4E		
069A	44		
069B	AD	1100	DEF 077,'PEB',0A2,9,046
069C	53		
069D	59		
069E	34		
069F	70	1065	DEF 070,'OCT',0A1,2,077,05
06A0	4F		
06A1	43		
06A2	54		
06A3	A4	1105	DEF 076,'IND',0A2,01,060,023
06A4	02		
06A5	77		
06A6	05		
06A7	72	1070	DEF 072,'PAV',0A1,024,065,027
06A8	50		
06A9	44		
06AA	56		
06AB	A4	1110	DEF 074,'LAC',0A2,039,077,028
06AC	24		
06AD	65		
06AE	27		
06AF	79	1075	DEF 07B,'OCT',0A1,039,077,028
06B0	4F		
06B1	43		
06B2	54		
06B3	A4	1115	DEF 07D,'LAC',0A2,030,060,010
06B4	39		
06B5	77		
06B6	39		
06B7	74	1080	DEF 074,'PEG',0A1,043,9,046
06B8	50		
06B9	45		
06BA	47		
06BB	24	1120	DEF 073,'PSA',0A2,035,027,02
06BC	43		
06BD	09		
06BE	46		
06BF	74	1085	DEF 074,'IND',0A2,1,056,051
06C0	49		
06C1	4E		
06C2	44		
06C3	AD	1125	DEF 075,'PEB',0A2,040,070,012
06C4	04		
06C5	56		
06C6	54		
06C7	7A	1090	DEF 07A,'PSA',0A2,7,033,4
06C8	50		
06C9	53		
06CA	44		
06CB	AD	1130	DEF 078,'PEB',0A2,042,070,012

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0400	33		
040E	04		
040F	7E	1095	DEF 07E, 'PEG', 022, 9, 033, 4
04D0	50		
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04D2	47		
04D3	22	1135	DEF 077, 'PEG', 022, 040, 023, 027
04D4	09		
04D5	33		
04D6	04		
04D7	77	1100	DEF 077, 'PEG', 022, 9, 6, 5
04D8	50		
04D9	45		
04DA	47		
04DB	22	1140	DEF 078, 'PEG', 022, 049, 024, 027
04DC	09		
04DD	06		
04DE	05		
04DF	70	1105	DEF 070, 'TUC', 0A2, 017, 060, 021
04E0	54		
04E1	55		
04E2	43		
04E3	A2	1135	DEF 070, 'PSA', 0A2, 056, 027, 043
04E4	47		
04E5	60		
04E6	21		
04E7	74	1110	DEF 071, 'LAC', 022, 022, 052, 7
04E8	40		
04E9	44		
04EA	43		
04EB	22	1150	DEF 070, 'LAC', 0A2, 054, 027, 043
04EC	22		
04ED	52		
04EE	07		
04EF	70	1115	DEF 070, 'LAC', 022, 030, 050, 010
04F0	40		
04F1	44		
04F2	43		
04F3	22	1155	DEF 071, 'PEB', 023, 02, 027, 054
04F4	30		
04F5	50		
04F6	40		
04F7	74	1120	DEF 074, 'PSA', 0A2, 039, 027, 8
04F8	50		
04F9	53		
04FA	44		
04FB	A2	1160	DEF 070, 'PEB', 023, 3, 015, 5
04FC	39		
04FD	27		
04FE	08		
04FF	75	1125	DEF 075, 'PEG', 022, 040, 010, 043
0700	50		
0701	45		
0702	47		
0703	22	1165	DEF 073, 'PIS', 023, 014, 31010
0704	40		
0705	40		
0706	43		
0707	76	1130	DEF 076, 'PEG', 022, 042, 030, 06

0709	50		
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070A	47		
070B	22	1120	DEF 072, 'PUB', 023, 015, 015, 027
070C	42		
070D	30		
070E	04		
070F	79	1135	DEF 079, 'PEG', 022, 045, 023, 027
0710	50		
0711	45		
0712	47		
0713	22	1135	DEF 073, 'SCL', 0A3, 047, 028, 014
0714	45		
0715	23		
0716	27		
0717	7A	1140	DEF 07A, 'PEG', 022, 049, 024, 029
0718	50		
0719	45		
071A	47		
071B	22	1140	DEF 071, 'PEG', 023, 019, 023, 027
071C	49	1145	DEF 062, 'PEG', 023, 024, 023, 017
071D	24		
071E	29		
071F	70	1145	DEF 070, 'PSA', 0A2, 056, 029, 043
0720	50		
0721	53		
0722	44		
0723	A2		
0724	54	1150	DEF 077, 'PIS', 023, 026, 2, 016
0725	29		
0726	43		
0727	44	1150	DEF 'FOMA', 0A2, 056, 029, 043
0728	4F		
0729	4D		
072A	44		
072B	A2		
072C	54	1155	DEF 071, 'SCL', 0A3, 047, 028, 014
072D	29		
072E	43		
072F	74	1155	DEF 071, 'PEG', 023, 02, 027, 058
0730	50		
0731	45		
0732	47		
0733	23		
0734	02	1200	DEF 073, 'SCL', 0A3, 047, 028, 014
0735	27		
0736	59		
0737	70	1160	DEF 070, 'PEG', 023, 3, 015, 5
0738	50		
0739	45		
073A	47		
073B	23		
073C	03	1205	DEF 063, 'PEG', 023, 051, 019, 0
073D	15		
073E	05		
073F	72	1165	DEF 072, 'PIS', 023, 016, 3, 010
0740	50		
0741	49		
0742	53		
0743	23		

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0746 10 .
0747 72 . 1170 DEF 072, 'TUC', 023, 016, 058, 020
0748 54 .
0749 55 .
074A 43 .
074B 23 .
074C 16 . 1171 DEF 072, 'TUC', 023, 058, 6, 065
074D 59 .
074E 20 .
074F 72 . 1175 DEF 072, 'SCL', 0A3, 017, 032, 038
0750 53 .
0751 43 .
0752 40 .
0753 A3 .
0754 17 . 1180 DEF 074, 'TUC', 0A3, 058, 0A5, 0A5
0755 32 .
0756 39 .
0757 81 . 1180 DEF 081 'PEG', 023, 019, 023, 037
0758 82 . 1185 DEF 082, 'PEG', 023, 024, 023, 017
0759 50 .
075A 45 .
075B 47 .
075C 23 . 1185 END
075D 24 .
075E 23 .
075F 17 .
0760 77 . 1190 DEF 077, 'PIS', 023, 026, 6, 016
0761 50 .
0762 49 .
0763 53 .
0764 23 .
0765 26 .
0766 06 .
0767 16 .
0768 71 . 1195 DEF 071, 'SCL', 0A3, 031, 037, 055
0769 53 .
076A 43 .
076B 40 .
076C A3 .
076D 31 .
076E 37 .
076F 55 .
0770 73 . 1200 DEF 073, 'SCL', 0A3, 047, 028, 014
0771 53 .
0772 43 .
0773 40 .
0774 A3 .
0775 47 .
0776 29 .
0777 14 .
0778 83 . 1205 DEF 083, 'PEG', 023, 051, 019, 0
0779 50 .
077A 45 .
077B 47 .
077C 23 .
077D 54 .
077E 19 .
077F 00 .

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0790 7E 1210 DEF 07E, 'PHE', 0A3, 057, 052, 051

0791 50

0792 48

0793 45

0794 A3

0795 57

0796 52

0797 54

0798 85 1215

DEF 085, 'PIS', 023, 058, 6, 045

0799 50

079A 49

079B 53

079C 23

079D 58

079E 06

079F 45

0790 74 1220

DEF 074, 'TUC', 0A3, 058, 065, 040

0791 54

0792 55

0793 43

0794 A3

0795 58

0796 45

0797 40

0798 20 1225

END * 089, 081, 021, 0, 027

0799 20

079A 20

079B 20

079C 20

079D 20

079E 20

079F 20

0800 40 0025

DEF '83', 0FF, 0FF, 013, 040, 022, 020

0801 30

0802 15

0803 15

0804 13

0805 10

0806 06

0807 20

0808 85 0030

DEF '5272', 012, 040, 02M, 022

0809 23

080A 27

080B 30

080C 13

080D 30

080E 20

080F 20

0810 40 0035

DEF '84', 0FF, 0FF, 096, 021, 02M, 020

0811 34

0812 15

0813 15

0814 13

0815 10

0816 06

0817 20

0818 85 0040

DEF '6151', 096, 021, 02M, 020

0819 34

0820 15

0821 15

0822 13

** MESSIER DIFFUSE OBJECTS-MODULE ** 01 SDD-680/85 META-A5BL V(1)

0000 4D	0005	DEF	'M1',OFF,OFF,5,032,022,1
0001 24			
0002 FF			
0003 FF			
0004 05			
0005 32			
0006 22			
0007 91			
0008 31	0010	DEF	'1952',5,032,022,1
0009 39			
000A 35			
000B 22			
000C 05			
000D 32			
000E 32			
000F 91			
0010 4D	0015	DEF	'M2',OFF,OFF,0A1,031,0,057
0011 32			
0012 FF			
0013 FF			
0014 A4			
0015 31			
0016 00			
0017 57			
0018 37	0020	DEF	'7089',0A1,031,0,057
0019 30			
001A 39			
001B 39			
001C A4			
001D 31			
001E 00			
001F 57			
0020 4D	0025	DEF	'M3',OFF,OFF,013,040,028,032
0021 32			
0022 FF			
0023 FF			
0024 13			
0025 40			
0026 28			
0027 32			
0028 25	0030	DEF	'5272',013,040,028,032
0029 32			
002A 37			
002B 32			
002C 13			
002D 40			
002E 28			
002F 32			
0030 4D	0035	DEF	'M4',OFF,OFF,096,021,026,026
0031 34			
0032 FF			
0033 FF			
0034 93			
0035 24			
0036 26			
0037 26			
0038 33	0040	DEF	'6121',096,021,026,026
0039 31			
003A 32			
003B 31			

0030	94		
0030	24		
003E	26		
003F	26		
0040	4D	0045	DEF 'M5',OFF,OFF,015,017,2,013
0041	35		
0042	FF		
0043	FF		
0044	15	0045	DEF 'M5',OFF,OFF,015,017,2,013
0045	17		
0046	02		
0047	13		
0048	25	0050	DEF '5904',015,017,2,013
0049	39		
004A	30		
004B	24		
004C	15	0050	DEF '5904',015,017,2,013
004D	17		
004E	02		
004F	13		
0050	4D	0055	DEF 'M6',OFF,OFF,097,038,032,011
0051	36		
0052	FF		
0053	FF		
0054	97	0055	DEF 'M6',OFF,OFF,097,038,032,011
0055	39		
0056	32		
0057	14		
0058	36	0060	DEF '6405',097,038,032,011
0059	34		
005A	30		
005B	35		
005C	97	0100	DEF '6405',097,038,032,011
005D	39		
005E	33		
005F	14		
0060	4D	0065	DEF 'M7',OFF,OFF,097,051,034,048
0061	37		
0062	FF		
0063	FF		
0064	97	0105	DEF 'M7',OFF,OFF,097,051,034,048
0065	54		
0066	34		
0067	48		
0068	36	0070	DEF '6475',097,051,034,048
0069	34		
006A	37		
006B	35		
006C	97	0075	DEF '6705',098,049,3,019
006D	54		
006E	34		
006F	48		
0070	4D	0075	DEF 'M8',OFF,OFF,098,1,024,023
0071	38		
0072	FF		
0073	FF		
0074	98	0115	DEF 'M8',OFF,OFF,098,1,024,023
0075	04		
0076	24		
0077	23		

0079	34	0080	DEF	'6523',098,1,024,023
0079	35			
007A	32			
007B	32			
007C	99	0104	DEF	'6524',098,1,024,023
007D	04			
007E	24			
007F	23			
0080	4D	0085	DEF	'M9',OFF,OFF,097,017,018,029
0081	39			
0082	FF			
0083	FF			
0084	97	0125	DEF	'6525',097,017,018,029
0085	17			
0086	18			
0087	29			
0088	36	0090	DEF	'6333',097,017,018,029
0089	32			
008A	32			
008B	32			
008C	97	0130	DEF	'6334',097,017,018,029
008D	17			
008E	18			
008F	29			
0090	4D	0095	DEF	'M10',OFF,096,055,04,04
0091	34			
0092	30			
0093	FF			
0094	96	0135	DEF	'6335',097,017,018,029
0095	55			
0096	04			
0097	04			
0098	36	0100	DEF	'6254',096,055,4,4
0099	32			
009A	35			
009B	34			
009C	96	0140	DEF	'6336',097,017,018,029
009D	55			
009E	04			
009F	04			
00A0	4D	0105	DEF	'M11',OFF,098,049,6,019
00A1	34			
00A2	34			
00A3	FF			
00A4	98	0145	DEF	'6337',097,017,018,029
00A5	49			
00A6	06			
00A7	19			
00A8	36	0110	DEF	'6705',098,049,6,019
00A9	37			
00AA	30			
00AB	35			
00AC	98	0150	DEF	'6338',097,017,018,029
00AD	49			
00AE	06			
00AF	19			
00B0	4D	0115	DEF	'M12',OFF,096,045,1,054
00B1	34			
00B2	32			
00B3	FF			

00B4	96		DEF	'6218',096,045,1,054
00B5	45			
00B6	01			
00B7	54			
00B8	36	0120	DEF	'6218',096,045,1,054
00B9	32			
00BA	31			
00BB	38			
00BC	96	0120	DEF	'6218',096,045,1,054
00BD	45			
00BE	01			
00BF	54			
00C0	40	0125	DEF	'M13',0FF,016,040,036,031
00C1	31			
00C2	32			
00C3	FF			
00C4	16	0135	DEF	'M13',0FF,016,040,036,031
00C5	40			
00C6	36			
00C7	31			
00C8	36	0130	DEF	'6205',016,040,038,031
00C9	32			
00CA	38			
00CB	35			
00CC	16	0130	DEF	'6205',016,040,038,031
00CD	40			
00CE	38			
00CF	31			
00D0	40	0135	DEF	'M14',0FF,097,036,3,014
00D1	31			
00D2	34			
00D3	FF			
00D4	97	0135	DEF	'M14',0FF,097,036,3,014
00D5	36			
00D6	03			
00D7	14			
00D8	36	0140	DEF	'6402',097,036,3,014
00D9	34			
00DA	30			
00DB	32			
00DC	97	0130	DEF	'6402',097,036,3,014
00DD	36			
00DE	03			
00DF	14			
00E0	40	0145	DEF	'M15',0FF,021,028,012,2
00E1	31			
00E2	35			
00E3	FF			
00E4	21	0145	DEF	'M15',0FF,021,028,012,2
00E5	28			
00E6	12			
00E7	02			
00E8	37	0150	DEF	'7078',021,028,012,2
00E9	30			
00EA	27			
00EB	38			
00EC	21	0130	DEF	'7078',021,028,012,2
00ED	38			
00EE	12			
00EF	02			

00F0	4D	0155	DEF	'M16',OFF,098,017,013,048
00F1	31			
00F2	36			
00F3	FF			
00F4	98			
00F5	17			
00F6	12			
00F7	48			
00F8	36	0160	DEF	'6611',098,017,013,048
00F9	36			
00FA	31			
00FB	31			
00FC	98			
00FD	17			
00FE	12			
00FF	48			
0100	4D	0165	DEF	'M17',OFF,098,019,016,012
0101	31			
0102	37			
0103	FF			
0104	98			
0105	19			
0106	16			
0107	12			
0108	36	0170	DEF	'6618',098,019,016,012
0109	36			
010A	31			
010B	38			
010C	98			
010D	19			
010E	16			
010F	12			
0110	4D	0175	DEF	'M18',OFF,098,018,017,9
0111	31			
0112	38			
0113	FF			
0114	98			
0115	18			
0116	17			
0117	09			
0118	36	0180	DEF	'6613',098,018,017,9
0119	36			
011A	31			
011B	23			
011C	98			
011D	18			
011E	17			
011F	09			
0120	4D	0185	DEF	'M19',OFF,097,0,026,013
0121	31			
0122	39			
0123	FF			
0124	97			
0125	00			
0126	26			
0127	13			
0128	36	0190	DEF	'6273',097,0,026,013
0129	32			
012A	37			
012B	32			

0120	97	0190		
0120	00			
012E	26			
012F	13			
0130	4D	0195	DEF	'M20',OFF,098,0,023,2
0131	32			
0132	30			
0132	FF			
0134	98	0200		
0135	00			
0136	23			
0137	02			
0139	36	0200	DEF	'6514',098,0,023,2
0139	35			
013A	34			
0139	34			
013C	98	0200		
013D	00			
013E	23			
013F	02			
0140	4D	0205	DEF	'M21',OFF,098,2,022,030
0141	32			
0142	34			
0142	FF			
0144	98	0205		
0145	02			
0146	22			
0147	30			
0149	36	0210	DEF	'6531',098,2,022,030
0149	35			
014A	33			
014B	34			
014C	98	0210		
014D	02			
014E	22			
014F	30			
0150	4D	0215	DEF	'M22',OFF,098,034,023,056
0151	32			
0152	32			
0153	FF			
0154	98	0220		
0155	34			
0156	23			
0157	56			
0159	36	0220	DEF	'6656',098,034,023,056
0159	36			
015A	35			
015B	36			
015C	98	0220		
015D	34			
015E	23			
015F	56			
0160	4D	0225	DEF	'M23',OFF,097,055,019,0
0161	32			
0162	32			
0162	FF			
0164	97	0225		
0165	55			
0166	19			
0167	00			

0169 36	0230	DEF	'6494',097,055,019,0
0169 34			
016A 39			
016B 34			
016C 97	0231	DEF	'6495',097,055,019,0
016D 55			
016E 19			
016F 00			
0170 4D	0235	DEF	'M24',0FF,098,016,018,027
0171 32			
0172 34			
0173 FF			
0174 98	0235	DEF	'M24',0FF,098,016,018,027
0175 16			
0176 18			
0177 27			
0178 36	0240	DEF	'6603',098,016,018,027
0179 36			
017A 30			
017B 33			
017C 98	0240	DEF	'6603',098,016,018,027
017D 16			
017E 19			
017F 27			
0180 4D	0245	DEF	'M25',0FF,098,029,019,016
0181 32			
0182 35			
0182 FF			
0184 98	0245	DEF	'M25',0FF,098,029,019,016
0185 29			
0186 19			
0187 16			
0188 34	0250	DEF	'4725',098,029,019,016
0189 37			
018A 32			
018B 35			
018C 98	0250	DEF	'4725',098,029,019,016
018D 29			
018E 19			
018F 16			
0190 4D	0255	DEF	'M26',0FF,098,043,9,026
0191 32			
0192 36			
0193 FF			
0194 98	0255	DEF	'M26',0FF,098,043,9,026
0195 43			
0196 09			
0197 26			
0198 36	0260	DEF	'6694',098,043,9,026
0199 36			
019A 39			
019B 34			
019C 98	0260	DEF	'6694',098,043,9,026
019D 43			
019E 09			
019F 26			
01A0 4D	0265	DEF	'M27',0FF,019,058,022,038
01A1 32			
01A2 37			
01A3 FF			

01A4	19			
01A5	58			
01A6	22			
01A7	39			
01A8	36	0270	DEF	'6853',019,058,022,038
01A9	39			
01AA	35			
01AB	33			
01AC	19	0310		
01AD	58			
01AE	22			
01AF	39			
01B0	40	0275	DEF	'M28',OFF,098,022,024,052
01B1	32			
01B2	39			
01B3	FF			
01B4	98	0310		
01B5	22			
01B6	24			
01B7	52			
01B8	36	0280	DEF	'6626',098,022,024,052
01B9	36			
01BA	32			
01BB	36			
01BC	98	0320		
01BD	22			
01BE	24			
01BF	52			
01C0	40	0285	DEF	'M29',OFF,020,022,038,025
01C1	32			
01C2	39			
01C3	FF			
01C4	20	0315		
01C5	22			
01C6	39			
01C7	25			
01C8	36	0290	DEF	'6913',020,022,039,025
01C9	39			
01CA	34			
01CB	33			
01CC	20	0330		
01CD	22			
01CE	39			
01CF	25			
01D0	40	0295	DEF	'M30',OFF,0A1,038,023,018
01D1	32			
01D2	30			
01D3	FF			
01D4	A4	0305		
01D5	39			
01D6	22			
01D7	18			
01D8	37	0300	DEF	'7099',0A1,038,023,018
01D9	30			
01DA	39			
01DB	39			
01DC	A4	0340		
01DD	39			
01DE	22			
01DF	18			

01E0	4D	0305	DEF	'M31',OFF,0,041,041,6
01E1	32			
01E2	31			
01E3	FF			
01E4	00			
01E5	41			
01E6	41			
01E7	06			
01E9	32	0310	DEF	'224',OFF,0,041,041,6
01E9	32			
01EA	34			
01EB	FF			
01EC	00			
01ED	41			
01EE	41			
01EF	06			
01F0	4D	0315	DEF	'M32',OFF,0,041,040,042
01F1	32			
01F2	32			
01F3	FF			
01F4	00			
01F5	41			
01F6	40			
01F7	42			
01F8	32	0320	DEF	'221',OFF,0,041,040,042
01F9	32			
01FA	34			
01FB	FF			
01FC	00			
01FD	41			
01FE	40			
01FF	42			
0200	4D	0325	DEF	'M33',OFF,1,032,030,030
0201	32			
0202	32			
0203	FF			
0204	04			
0205	32			
0206	30			
0207	30			
0209	35	0330	DEF	'598',OFF,1,032,030,030
0209	39			
020A	39			
020B	FF			
020C	04			
020D	32			
020E	30			
020F	30			
0210	4D	0335	DEF	'M34',OFF,2,040,042,040
0211	32			
0212	34			
0213	FF			
0214	02			
0215	40			
0216	42			
0217	40			
0218	34	0340	DEF	'1039',2,040,042,040
0219	30			
021A	32			
021B	39			

021C	02				
021D	10				
021E	12				
021F	10				
0220	10	0345	DEF	'M35',OFF,6,7,024,021	
0221	32				
0222	35				
0223	FF				
0224	06	0345	DEF	'M35',OFF,6,7,021,048,016	
0225	07				
0226	24				
0227	21				
0228	32	0350	DEF	'2168',6,7,024,021	
0229	34				
022A	36				
022B	39				
022C	06	0340	DEF	'2162',021,031,048,016	
022D	07				
022E	24				
022F	21				
0230	10	0355	DEF	'M36',OFF,5,034,034,5	
0231	32				
0232	36				
0233	FF				
0234	05	0340	DEF	'M37',OFF,024,048,034,016	
0235	34				
0236	34				
0237	05				
0238	34	0360	DEF	'1960',5,034,034,5	
0239	39				
023A	36				
023B	30				
023C	05	0400	DEF	'1217',024,045,048,042	
023D	34				
023E	34				
023F	05				
0240	10	0365	DEF	'M37',OFF,5,050,032,033	
0241	32				
0242	37				
0243	FF				
0244	05	0400	DEF	'1962',OFF,024,048,034,016	
0245	50				
0246	32				
0247	32				
0248	32	0370	DEF	'2099',5,050,032,033	
0249	30				
024A	39				
024B	39				
024C	05	0410	DEF	'1978',024,032,034,016	
024D	50				
024E	32				
024F	32				
0250	10	0375	DEF	'M38',OFF,5,026,035,048	
0251	32				
0252	39				
0253	FF				
0254	05	0410	DEF	'1978',OFF,024,034,016	
0255	24				
0256	35				
0257	18				

0258	34	0380	DEF	'1912',5,026,035,048
0259	39			
025A	34			
025B	32			
025C	05	0420	DEF	'1762',085,033,5,024
025D	26			
025E	35			
025F	48			
0260	4D	0385	DEF	'M39',OFF,021,031,048,018
0261	33			
0262	39			
0263	FF			
0264	24	0425	DEF	'M47',OFF,08,030,020,02
0265	34			
0266	48			
0267	48			
0268	37	0390	DEF	'7092',021,031,048,018
0269	30			
026A	39			
026B	32			
026C	24	0430	DEF	'2432',08,030,020,02
026D	34			
026E	48			
026F	48			
0270	4D	0395	DEF	'M41',OFF,086,045,020,042
0271	34			
0272	34			
0273	FF			
0274	36	0435	DEF	'M43',OFF,08,045,020,02
0275	45			
0276	20			
0277	42			
0278	32	0400	DEF	'2287',086,045,020,042
0279	32			
027A	38			
027B	37			
027C	36	0440	DEF	'M52',OFF,087,040,014,040
027D	45			
027E	20			
027F	42			
0280	4D	0405	DEF	'M42',OFF,085,033,5,024
0281	34			
0282	32			
0283	FF			
0284	35	0455	DEF	'2437',087,040,014,040
0285	32			
0286	05			
0287	24			
0288	34	0410	DEF	'1976',085,033,5,024
0289	39			
028A	37			
028B	36			
028C	35	0450	DEF	'M47',OFF,087,040,014,040
028D	32			
028E	05			
028F	24			
0290	4D	0415	DEF	'M43',OFF,085,034,5,018
0291	34			
0292	32			
0293	FF			

0294	85				
0295	34				
0296	05				
0297	18				
0298	34	0420	DEF	'1982',085,043,5,018	
0299	39				
029A	38				
029B	32				
029C	85	0420	DEF	'M48',OFF,088,012,3,011	
029D	43				
029E	05				
029F	18				
02A0	4D	0425	DEF	'M44',OFF,8,038,020,6	
02A1	34				
02A2	34				
02A3	FF				
02A4	08	0425	DEF	'25-85',080,012,3,011	
02A5	38				
02A6	20				
02A7	06				
02A8	32	0430	DEF	'2632',8,038,020,6	
02A9	36				
02AA	33				
02AB	32				
02AC	08	0420	DEF	'M48',OFF,8,038,020,6	
02AD	38				
02AE	20				
02AF	06				
02B0	4D	0435	DEF	'M45',OFF,3,045,024,1	
02B1	34				
02B2	35				
02B3	FF				
02B4	03	0425	DEF	'M42',012,030,2,011	
02B5	45				
02B6	24				
02B7	04				
02B8	4D	0440	DEF	'M46',OFF,087,040,014,045	
02B9	34				
02BA	36				
02BB	FF				
02BC	97	0450	DEF	'M50',OFF,087,1,2,012	
02BD	40				
02BE	44				
02BF	45				
02C0	32	0445	DEF	'2437',087,040,014,045	
02C1	34				
02C2	33				
02C3	37				
02C4	97	0450	DEF	'2329',087,1,2,012	
02C5	40				
02C6	14				
02C7	45				
02C8	4D	0450	DEF	'M47',OFF,087,035,014,026	
02C9	34				
02CA	37				
02CB	FF				
02CC	97	0450	DEF	'M51',OFF,013,028,027,011	
02CD	35				
02CE	14				
02CF	06				

02D0	32	0455	DEF	'2422',087,035,014,026
02D1	34			
02D2	32			
02D3	32			
02D4	37	0455	DEF	'2423',087,035,014,026
02D5	35			
02D6	14			
02D7	26			
02D8	4D	0460	DEF	'M48',0FF,088,012,5,041
02D9	34			
02DA	39			
02DB	FF			
02DC	38	0500	DEF	'M52',0FF,023,025,021,024
02DD	12			
02DE	05			
02DF	41			
02E0	32	0465	DEF	'2548',088,012,5,041
02E1	35			
02E2	34			
02E3	39			
02E4	38	0500	DEF	'2554',023,022,021,024
02E5	12			
02E6	05			
02E7	41			
02E8	4D	0470	DEF	'M49',0FF,012,028,8,010
02E9	34			
02EA	39			
02EB	FF			
02EC	12	0510	DEF	'M53',0FF,013,014,010,020
02ED	29			
02EE	09			
02EF	10			
02F0	34	0475	DEF	'4472',012,028,8,010
02F1	34			
02F2	37			
02F3	32			
02F4	12	0515	DEF	'502',013,011,010,020
02F5	29			
02F6	09			
02F7	10			
02F8	4D	0480	DEF	'M50',0FF,087,1,8,018
02F9	35			
02FA	30			
02FB	FF			
02FC	37	0520	DEF	'M54',0FF,026,023,020,027
02FD	04			
02FE	09			
02FF	10			
0300	32	0485	DEF	'2323',087,1,8,018
0301	32			
0302	32			
0303	32			
0304	37	0525	DEF	'5713',026,023,020,027
0305	04			
0306	09			
0307	10			
0308	4D	0490	DEF	'M51',0FF,013,028,047,021
0309	35			
030A	34			
030B	FF			

0300	13				
0300	28				
030E	17				
030F	21				
0310	35	0495	DEF	'5194',013,028,047,021	
0311	31				
0312	39				
0313	34				
0314	13	0505	DEF	'5205',019,036,031,1	
0315	28				
0316	17				
0317	21				
0318	40	0500	DEF	'M52',OFF,023,022,061,026	
0319	35				
031A	32				
031B	FF				
031C	23	0540	DEF	'5047',OFF,019,035,030,1	
031D	22				
031E	11				
031F	26				
0320	37	0505	DEF	'7654',023,022,061,026	
0321	36				
0322	35				
0323	34				
0324	23	0545	DEF	'5728',019,035,030,1	
0325	22				
0326	11				
0327	26				
0328	40	0510	DEF	'M53',OFF,013,011,018,020	
0329	35				
032A	33				
032B	FF				
032C	13	0500	DEF	'M52',OFF,018,052,030,0	
032D	11				
032E	18				
032F	20				
0330	35	0515	DEF	'5024',013,011,018,020	
0331	30				
0332	32				
0333	34				
0334	13	0500	DEF	'5720',018,052,033,0	
0335	11				
0336	18				
0337	20				
0338	40	0520	DEF	'M54',OFF,098,053,030,031	
0339	35				
033A	34				
033B	FF				
033C	99	0500	DEF	'M58',OFF,012,036,011,057	
033D	53				
033E	30				
033F	21				
0340	36	0525	DEF	'6715',098,053,030,031	
0341	37				
0342	31				
0343	35				
0344	99	0545	DEF	'6579',012,036,011,057	
0345	53				
0346	30				
0347	31				

0349	4D	0530	DEF	'M55',OFF,099,038,031,1
0349	35			
034A	35			
034B	FF			
034C	99	0530	DEF	'M55',OFF,099,038,031,1
034D	39			
034E	34			
034F	04			
0350	36	0535	DEF	'M609',099,038,031,1
0351	39			
0352	30			
0353	39			
0354	99	0535	DEF	'M609',099,038,031,1
0355	39			
0356	34			
0357	04			
0359	4D	0540	DEF	'M56',OFF,019,015,030,7
0359	35			
035A	36			
035B	FF			
035C	19	0540	DEF	'M56',OFF,019,015,030,7
035D	15			
035E	30			
035F	07			
0360	36	0545	DEF	'M779',019,015,030,7
0361	37			
0362	37			
0363	39			
0364	19	0545	DEF	'M779',019,015,030,7
0365	15			
0366	30			
0367	07			
0369	4D	0550	DEF	'M57',OFF,018,052,033,0
0369	35			
036A	37			
036B	FF			
036C	19	0550	DEF	'M57',OFF,018,052,033,0
036D	52			
036E	33			
036F	00			
0370	36	0555	DEF	'M720',018,052,033,0
0371	37			
0372	32			
0373	30			
0374	19	0555	DEF	'M720',018,052,033,0
0375	52			
0376	33			
0377	00			
0379	4D	0560	DEF	'M58',OFF,012,036,011,059
0379	35			
037A	39			
037B	FF			
037C	12	0560	DEF	'M58',OFF,012,036,011,059
037D	36			
037E	14			
037F	59			
0390	34	0565	DEF	'M579',012,036,011,059
0391	35			
0392	37			
0393	39			

0384	12				
0385	36				
0386	11				
0387	59				
0388	40	0570	DEF	'M59',OFF,012,04,011,050	
0389	35				
038A	39				
038B	FF				
038C	12	0570	DEF	'M60',OFF,013,011,042,011	
038D	04				
038E	11				
038F	50				
0390	34	0575	DEF	'4621',012,04,011,05	
0391	36				
0392	32				
0393	31				
0394	12	0575	DEF	'4621',012,014,042,011	
0395	04				
0396	11				
0397	05				
0398	40	0580	DEF	'M60',OFF,012,042,011,044	
0399	36				
039A	30				
039B	FF				
039C	12	0580	DEF	'M60',OFF,012,042,011,044	
039D	42				
039E	11				
039F	44				
03A0	34	0585	DEF	'4649',012,042,011,044	
03A1	36				
03A2	34				
03A3	39				
03A4	12	0575	DEF	'4621',012,055,021,037	
03A5	42				
03A6	11				
03A7	44				
03A8	40	0590	DEF	'M61',OFF,012,020,4,039	
03A9	36				
03AA	31				
03AB	FF				
03AC	12	0580	DEF	'M60',OFF,013,012,013,010	
03AD	30				
03AE	04				
03AF	39				
03B0	34	0595	DEF	'4303',012,020,4,039	
03B1	33				
03B2	30				
03B3	33				
03B4	12	0635	DEF	'3620',011,017,013,010	
03B5	30				
03B6	04				
03B7	39				
03B8	40	0600	DEF	'M62',OFF,096,059,030,4	
03B9	36				
03BA	32				
03BB	FF				
03BC	96	0640	DEF	'M60',OFF,011,012,013,010	
03BD	59				
03BE	30				
03BF	04				

03C0	34	0605	DEF	'6266',096,059,030,4
03C1	32			
03C2	36			
03C3	36			
03C4	96	0605	DEF	'3217',011,010,013,010
03C5	59			
03C6	30			
03C7	04			
03C8	40	0610	DEF	'M63',0FF,013,014,042,011
03C9	36			
03CA	33			
03CB	FF			
03CC	13	0630	DEF	'M62',0FF,8,007,011,006
03CD	14			
03CE	42			
03CF	14			
03D0	35	0615	DEF	'5055',013,014,042,011
03D1	30			
03D2	35			
03D3	35			
03D4	13	0630	DEF	'2407',8,047,011,007
03D5	14			
03D6	42			
03D7	14			
03D8	40	0620	DEF	'M64',0FF,012,055,021,051
03D9	36			
03DA	34			
03DB	FF			
03DC	12	0640	DEF	'M60',0FF,093,089,088,095
03DD	55			
03DE	24			
03DF	54			
03E0	34	0625	DEF	'4826',012,055,021,051
03E1	38			
03E2	32			
03E3	36			
03E4	12	0625	DEF	'4531',092,087,086,093
03E5	55			
03E6	24			
03E7	54			
03E8	40	0630	DEF	'M65',0FF,011,017,013,016
03E9	36			
03EA	35			
03EB	FF			
03EC	14	0670	DEF	'M62',0FF,098,089,088,095
03ED	17			
03EE	13			
03EF	16			
03F0	33	0635	DEF	'3623',011,017,013,016
03F1	36			
03F2	32			
03F3	33			
03F4	14	0670	DEF	'M67',095,089,088,095
03F5	17			
03F6	13			
03F7	16			
03F8	40	0640	DEF	'M66',0FF,011,018,013,010
03F9	36			
03FA	36			
03FB	FF			

03FC	11				
03FD	18				
03FE	18				
03FF	10				
0400	38	0645	DEF	'3627',011,018,013,010	
0401	36				
0402	32				
0403	37				
0404	11				
0405	18				
0406	18				
0407	10				
0408	40	0650	DEF	'M67',0FF,8,049,011,056	
0409	36				
040A	37				
040B	FF				
040C	09				
040D	49				
040E	11				
040F	56				
0410	32	0655	DEF	'2682',8,049,011,056	
0411	36				
0412	39				
0413	32				
0414	09				
0415	49				
0416	11				
0417	56				
0418	40	0660	DEF	'M68',0FF,092,037,026,035	
0419	36				
041A	39				
041B	FF				
041C	92				
041D	37				
041E	26				
041F	35				
0420	34	0665	DEF	'4590',092,037,026,035	
0421	35				
0422	39				
0423	30				
0424	92				
0425	37				
0426	26				
0427	35				
0428	40	0670	DEF	'M69',0FF,098,029,032,023	
0429	36				
042A	39				
042B	FF				
042C	98				
042D	29				
042E	32				
042F	28				
0430	36	0675	DEF	'6637',098,029,032,023	
0431	36				
0432	33				
0433	37				
0434	98				
0435	29				
0436	32				
0437	23				

0438	4D	0680	DEF	'M70',OFF,098,041,032,019
0439	37			
043A	3D			
043B	FF			
043C	98	0680	DEF	'M70',OFF,098,041,032,019
043D	41			
043E	32			
043F	19			
0440	36	0685	DEF	'6681',098,041,032,019
0441	36			
0442	39			
0443	34			
0444	98	0685	DEF	'M70',OFF,098,041,032,019
0445	41			
0446	32			
0447	19			
0448	4D	0690	DEF	'M71',OFF,019,052,018,042
0449	37			
044A	34			
044B	FF			
044C	19	0690	DEF	'M71',OFF,019,052,018,042
044D	52			
044E	18			
044F	42			
0450	36	0695	DEF	'6838',019,052,018,042
0451	39			
0452	39			
0453	39			
0454	19	0695	DEF	'6838',019,052,018,042
0455	52			
0456	18			
0457	42			
0458	4D	0700	DEF	'M72',OFF,0A0,051,012,041
0459	37			
045A	32			
045B	FF			
045C	AD	0700	DEF	'M72',OFF,0A0,051,012,041
045D	54			
045E	12			
045F	41			
0460	36	0705	DEF	'6981',0A0,051,012,041
0461	39			
0462	39			
0463	34			
0464	AD	0705	DEF	'6981',0A0,051,012,041
0465	54			
0466	12			
0467	41			
0468	4D	0710	DEF	'M73',OFF,0A0,057,012,046
0469	37			
046A	33			
046B	FF			
046C	AD	0710	DEF	'M73',OFF,0A0,057,012,046
046D	57			
046E	12			
046F	46			
0470	36	0715	DEF	'6994',0A0,057,012,046
0471	39			
0472	39			
0473	36			

0474	AD				
0475	57				
0476	12				
0477	46				
0478	4D	0720	DEF	'M74',OFF,1,035,015,038	
0479	37				
047A	34				
047B	FF				
047C	04	0760	DEF	'M75',OFF,1,040,051,025	
047D	35				
047E	15				
047F	39				
0480	36	0725	DEF	'M28',OFF,1,035,015,038	
0481	32				
0482	39				
0483	FF				
0484	04	0765	DEF	'M29',OFF,1,040,051,025	
0485	35				
0486	15				
0487	39				
0488	4D	0730	DEF	'M75',OFF,0A0,4,022,1	
0489	37				
048A	35				
048B	FF				
048C	AD	0770	DEF	'M76',OFF,1,040,051,025	
048D	04				
048E	22				
048F	04				
0490	36	0735	DEF	'M84',OFF,0A0,4,022,1	
0491	39				
0492	36				
0493	34				
0494	AD	0775	DEF	'M85',OFF,0A0,4,022,1	
0495	04				
0496	22				
0497	04				
0498	4D	0740	DEF	'M76',OFF,1,040,051,025	
0499	37				
049A	36				
049B	FF				
049C	04	0780	DEF	'M80',OFF,076,015,012,10	
049D	4D				
049E	54				
049F	25				
04A0	36	0745	DEF	'M50',OFF,1,040,051,025	
04A1	35				
04A2	3D				
04A3	FF				
04A4	04	0785	DEF	'M81',OFF,096,010,072,107	
04A5	4D				
04A6	54				
04A7	35				
04A8	4D	0750	DEF	'M77',OFF,082,041,0,7	
04A9	37				
04AA	37				
04AB	FF				
04AC	92	0790	DEF	'M81',OFF,0,050,040,012	
04AD	44				
04AE	00				
04AF	07				

04B0	31	0755	DEF	'1068',082,041,0,7
04B1	30			
04B2	36			
04B3	38			
04B4	32	0775	DEF	'1061',5,053,069,012
04B5	41			
04B6	00			
04B7	07			
04B8	40	0760	DEF	'M78',OFF,5,045,0,2
04B9	37			
04BA	39			
04BB	FF			
04BC	05	0800	DEF	'M77',OFF,9,040,061,000
04BD	45			
04BE	00			
04BF	02			
04C0	32	0765	DEF	'2068',5,045,0,2
04C1	30			
04C2	36			
04C3	38			
04C4	05	0805	DEF	'M74',9,053,049,030
04C5	45			
04C6	00			
04C7	02			
04C8	40	0770	DEF	'M79',OFF,085,022,024,033
04C9	37			
04CA	39			
04CB	FF			
04CC	05	0810	DEF	'M72',OFF,093,035,029,041
04CD	22			
04CE	24			
04CF	33			
04D0	31	0775	DEF	'1904',085,022,024,033
04D1	39			
04D2	30			
04D3	34			
04D4	05	0815	DEF	'M73',098,025,027,040
04D5	22			
04D6	24			
04D7	33			
04D8	40	0780	DEF	'M80',OFF,096,015,022,55
04D9	38			
04DA	30			
04DB	FF			
04DC	96	0820	DEF	'M71',OFF,012,023,013,3
04DD	15			
04DE	23			
04DF	37			
04E0	36	0785	DEF	'6093',096,015,022,055
04E1	30			
04E2	39			
04E3	33			
04E4	96	0825	DEF	'M82',012,023,013,3
04E5	15			
04E6	22			
04E7	55			
04E8	40	0790	DEF	'M81',OFF,9,053,069,012
04E9	38			
04EA	34			
04EB	FF			

04ED	09				
04ED	53				
04EE	69				
04EF	42				
04F0	33	0795	DEF	'3031',9,053,069,012	
04F1	30				
04F2	33				
04F3	34				
04F4	09	0830	DEF	'4362',012,023,013,021	
04F5	53				
04F6	69				
04F7	42				
04F8	4D	0800	DEF	'M82',OFF,9,053,069,050	
04F9	38				
04FA	32				
04FB	FF				
04FC	09	0850	DEF	'M85',OFF,012,024,013,021	
04FD	53				
04FE	69				
04FF	50				
0500	33	0805	DEF	'3034',9,053,069,050	
0501	30				
0502	33				
0503	34				
0504	09	0840	DEF	'4367',012,024,013,021	
0505	53				
0506	69				
0507	50				
0508	4D	0810	DEF	'M83',OFF,093,035,029,043	
0509	38				
050A	33				
050B	FF				
050C	93	0860	DEF	'M87',OFF,012,021,013,021	
050D	35				
050E	29				
050F	43				
0510	35	0815	DEF	'5236',093,035,029,043	
0511	32				
0512	33				
0513	36				
0514	93	0830	DEF	'4368',012,025,013,021	
0515	35				
0516	29				
0517	43				
0518	4D	0820	DEF	'M84',OFF,012,023,013,3	
0519	38				
051A	34				
051B	FF				
051C	12	0860	DEF	'M86',OFF,012,020,013,3,5	
051D	23				
051E	13				
051F	03				
0520	34	0825	DEF	'4382',012,023,013,3	
0521	33				
0522	38				
0523	32				
0524	13	0840	DEF	'4381',012,030,013,035	
0525	23				
0526	13				
0527	03				

0529	4D	0830	DEF	'M85',OFF,012,023,018,021
0529	39			
052A	35			
052B	FF			
052C	12	0830	DEF	'M85',OFF,012,023,018,021
052D	29			
052E	19			
052F	24			
0530	34	0835	DEF	'4382',012,023,018,021
0531	33			
0532	39			
0533	32			
0534	12	0835	DEF	'4382',012,023,018,021
0535	29			
0536	19			
0537	24			
0539	4D	0840	DEF	'M86',OFF,012,024,013,6
0539	39			
053A	36			
053B	FF			
053C	12	0840	DEF	'M86',OFF,012,024,013,6
053D	24			
053E	19			
053F	06			
0540	34	0845	DEF	'4406',012,024,013,6
0541	34			
0542	39			
0543	36			
0544	12	0845	DEF	'4406',012,024,013,6
0545	24			
0546	19			
0547	06			
0549	4D	0850	DEF	'M87',OFF,012,029,012,033
0549	39			
054A	37			
054B	FF			
054C	12	0850	DEF	'M87',OFF,012,029,012,033
054D	29			
054E	12			
054F	29			
0550	34	0855	DEF	'4486',012,029,012,033
0551	34			
0552	39			
0553	36			
0554	12	0855	DEF	'4486',012,029,012,033
0555	29			
0556	12			
0557	39			
0558	4D	0860	DEF	'M88',OFF,012,030,014,035
0559	39			
055A	39			
055B	FF			
055C	12	0860	DEF	'M88',OFF,012,030,014,035
055D	39			
055E	14			
055F	35			
0560	34	0865	DEF	'4501',012,030,014,035
0561	35			
0562	39			
0563	34			

0564	12				
0565	30				
0566	14				
0567	35				
0568	4D	0870	DEF	'M89',OFF,012,034,012,043	
0569	39				
056A	39				
056B	FF				
056C	12				
056D	34				
056E	12				
056F	12				
0570	34	0875	DEF	'4552',012,034,012,043	
0571	35				
0572	35				
0573	32				
0574	12				
0575	34				
0576	12				
0577	43				
0578	4D	0880	DEF	'M90',OFF,012,035,013,019	
0579	39				
057A	39				
057B	FF				
057C	12				
057D	35				
057E	12				
057F	19				
0580	34	0885	DEF	'4569',012,035,013,019	
0581	35				
0582	34				
0583	39				
0584	12				
0585	35				
0586	13				
0587	19				
0588	4D	0890	DEF	'M92',OFF,017,016,043,011	
0589	39				
058A	32				
058B	FF				
058C	17				
058D	16				
058E	43				
058F	14				
0590	36	0895	DEF	'6341',017,016,043,011	
0591	33				
0592	34				
0593	34				
0594	17				
0595	16				
0596	43				
0597	14				
0598	4D	0900	DEF	'M93',OFF,087,043,023,048	
0599	39				
059A	33				
059B	FF				
059C	37				
059D	43				
059E	23				
059F	48				

05A0	32	0905	DEF	'2447',087,043,023,048
05A1	34			
05A2	34			
05A3	37			
05A4	37			
05A5	43			
05A6	23			
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05A8	40	0910	DEF	'M94',0FF,012,049,041,017
05A9	39			
05AA	24			
05AB	FF			
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05AF	17			
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05B2	33			
05B3	26			
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05B7	17			
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05B9	39			
05BA	25			
05BB	FF			
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05BF	52			
05C0	32	0925	DEF	'3351',010,042,011,052
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05C2	35			
05C3	24			
05C4	10			
05C5	42			
05C6	14			
05C7	52			
05C8	40	0930	DEF	'M96',0FF,010,045,011,059
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05CA	36			
05CB	FF			
05CC	10			
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05CF	59			
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05D3	39			
05D4	10			
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05D6	14			
05D7	59			
05D8	40	0940	DEF	'M97',0FF,011,013,055,011
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05DA	37			
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05DC	14		
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05E0	33	0945	DEF '3587',011,013,055,011
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05E3	37		
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05EF	04		
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05FA	39		
05FB	FF		
05FC	12		
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0606	17		
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060B	30		
060C	12		
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060F	59		
0610	34	0975	DEF '4321',012,021,015,059
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0614	12		
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061A	30			
061B	31			
061C	14			
061D	02			
061E	54			
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0622	35			
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062A	30			
062B	33			
062C	04			
062D	31			
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062F	32			
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0631	38			
0632	31			
0633	FF			
0634	04			
0635	31			
0636	60			
0637	32			
0638	14	1000	END	*
0639	30	0995	DEF	'M091',011,050,011
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063B	30			
063C	34			
063D	14			
063E	03			
063F	03			
0640	14			
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0643	30			
0644	31			
0645	34			
0646	32			
0647	30			
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064A	14			
064B	30	0997	DEF	'M701',011,050,011
064C	30			
064D	30			
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064F	34			
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0652	30			
0653	30			
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0695	30			
0696	30			
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069B	30			
069C	30			
069D	30			
069E	30			
069F	30			
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06A3	30			
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06A5	30			
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06F8	30			
06F9	30			
06FA	30			
06FB	30			
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06FD	30			
06FE	30			
06FF	30			

0000	30	0001	DEF	'0101',011,052,3,010
0001	31			
0002	30			
0003	31			
0004	11	0001	DEF	'0101',011,052,3,010
0005	52			
0006	03			
0007	10			
0008	30	0002	DEF	'0201',011,052,3,010
0009	32			
000A	30			
000B	31			
000C	11	0010	DEF	'0201',011,052,3,010
000D	52			
000E	03			
000F	10			
0010	30	0003	DEF	'0301',011,052,3,010
0011	33			
0012	30			
0013	31			
0014	11	0011	DEF	'0301',011,052,3,010
0015	52			
0016	03			
0017	10			
0018	30	0004	DEF	'0401',011,052,3,011
0019	34			
001A	30			
001B	31			
001C	11	0012	DEF	'0401',011,052,3,011
001D	52			
001E	03			
001F	11			
0020	30	0005	DEF	'0501',011,052,3,011
0021	35			
0022	30			
0023	31			
0024	11	0013	DEF	'0501',011,052,3,011
0025	52			
0026	03			
0027	11			
0028	30	0006	DEF	'0601',011,052,3,011
0029	36			
002A	30			
002B	31			
002C	11	0014	DEF	'0601',011,052,3,011
002D	52			
002E	03			
002F	11			
0030	30	0007	DEF	'0701',011,052,3,011
0031	37			
0032	30			
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0035	52			
0036	03			
0037	11			
0038	30	0008	DEF	'0801',011,052,3,011
0039	38			
003A	30			
003B	31			

003C	14				
003D	52				
003E	03				
003F	14				
0040	30	0009	DEF	'0901',011,052,3,012	
0041	39				
0042	30				
0043	31				
0044	14	0017	DEF	'1001',011,052,3,012	
0045	52				
0046	03				
0047	12				
0048	31	0010	DEF	'1001',011,052,3,012	
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004A	30				
004B	31				
004C	14	0016	DEF	'1001',011,052,3,012	
004D	52				
004E	03				
004F	12				
0050	34	0011	DEF	'1101',011,052,3,013	
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0052	30				
0053	31				
0054	14	0017	DEF	'1101',011,052,3,013	
0055	52				
0056	03				
0057	13				
0058	34	0012	DEF	'1201',011,052,3,013	
0059	32				
005A	30				
005B	31				
005C	14	0020	DEF	'1201',011,052,3,013	
005D	52				
005E	03				
005F	13				
0060	34	0013	DEF	'1301',011,052,3,013	
0061	33				
0062	30				
0063	31				
0064	14	0021	DEF	'1301',011,052,3,013	
0065	52				
0066	03				
0067	13				
0068	34	0014	DEF	'1401',011,052,3,014	
0069	34				
006A	30				
006B	31				
006C	14	0022	DEF	'1401',011,052,3,014	
006D	52				
006E	03				
006F	14				
0070	34	0015	DEF	'1501',011,052,3,015	
0071	35				
0072	30				
0073	31				
0074	14	0023	DEF	'1501',011,052,3,015	
0075	52				
0076	03				
0077	15				

0078	34	0016	DEF	'1601',011,052,3,015
0079	36			
007A	30			
007B	34			
007C	14	0015	DEF	'1501',011,051,3,014
007D	52			
007E	03			
007F	15			
0080	34	0017	DEF	'1701',011,052,3,016
0081	37			
0082	30			
0083	34			
0084	14	0016	DEF	'1601',011,051,3,015
0085	52			
0086	03			
0087	15			
0088	34	0018	DEF	'1801',011,052,3,017
0089	39			
008A	30			
008B	34			
008C	14	0017	DEF	'1701',011,051,3,016
008D	52			
008E	03			
008F	17			
0090	34	0019	DEF	'1901',011,052,3,017
0091	39			
0092	30			
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0094	14	0018	DEF	'1801',011,051,3,016
0095	52			
0096	03			
0097	17			
0098	32	0020	DEF	'2001',011,052,3,018
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009A	30			
009B	34			
009C	14	0019	DEF	'1901',011,051,3,017
009D	52			
009E	03			
009F	18			
00A0	32	0021	DEF	'2101',011,051,3,019
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00A2	30			
00A3	34			
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00A5	54			
00A6	03			
00A7	19			
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00AA	30			
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00AD	54			
00AE	03			
00AF	20			
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00B2	30			
00B3	34			

00B4	11		
00B5	51		
00B6	03		
00B7	21		
00B8	32	0024	DEF '2401',011,051,3,022
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00BA	30		
00BB	31		
00BC	11		
00BD	51		
00BE	03		
00BF	22		
00C0	32	0025	DEF '2501',011,051,3,023
00C1	35		
00C2	30		
00C3	31		
00C4	11		
00C5	51		
00C6	03		
00C7	23		
00C8	32	0026	DEF '2601',011,051,3,024
00C9	34		
00CA	30		
00CB	34		
00CC	11		
00CD	51		
00CE	03		
00CF	24		
00D0	32	0027	DEF '2701',011,051,3,025
00D1	37		
00D2	30		
00D3	31		
00D4	11		
00D5	51		
00D6	03		
00D7	25		
00D8	32	0028	DEF '2801',011,051,3,026
00D9	39		
00DA	30		
00DB	31		
00DC	11		
00DD	51		
00DE	03		
00DF	26		
00E0	32	0029	DEF '2901',011,051,3,027
00E1	39		
00E2	30		
00E3	31		
00E4	11		
00E5	51		
00E6	03		
00E7	27		
00E8	33	0030	DEF '3001',011,050,3,028
00E9	30		
00EA	30		
00EB	31		
00EC	11		
00ED	50		
00EE	03		
00EF	28		

```
00F0 33      9031      DEF  '3101',011,050,3,029
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00F2 30
00F3 34
00F4 44
00F5 50
00F6 03
00F7 29
00F8      0032      END  *
```

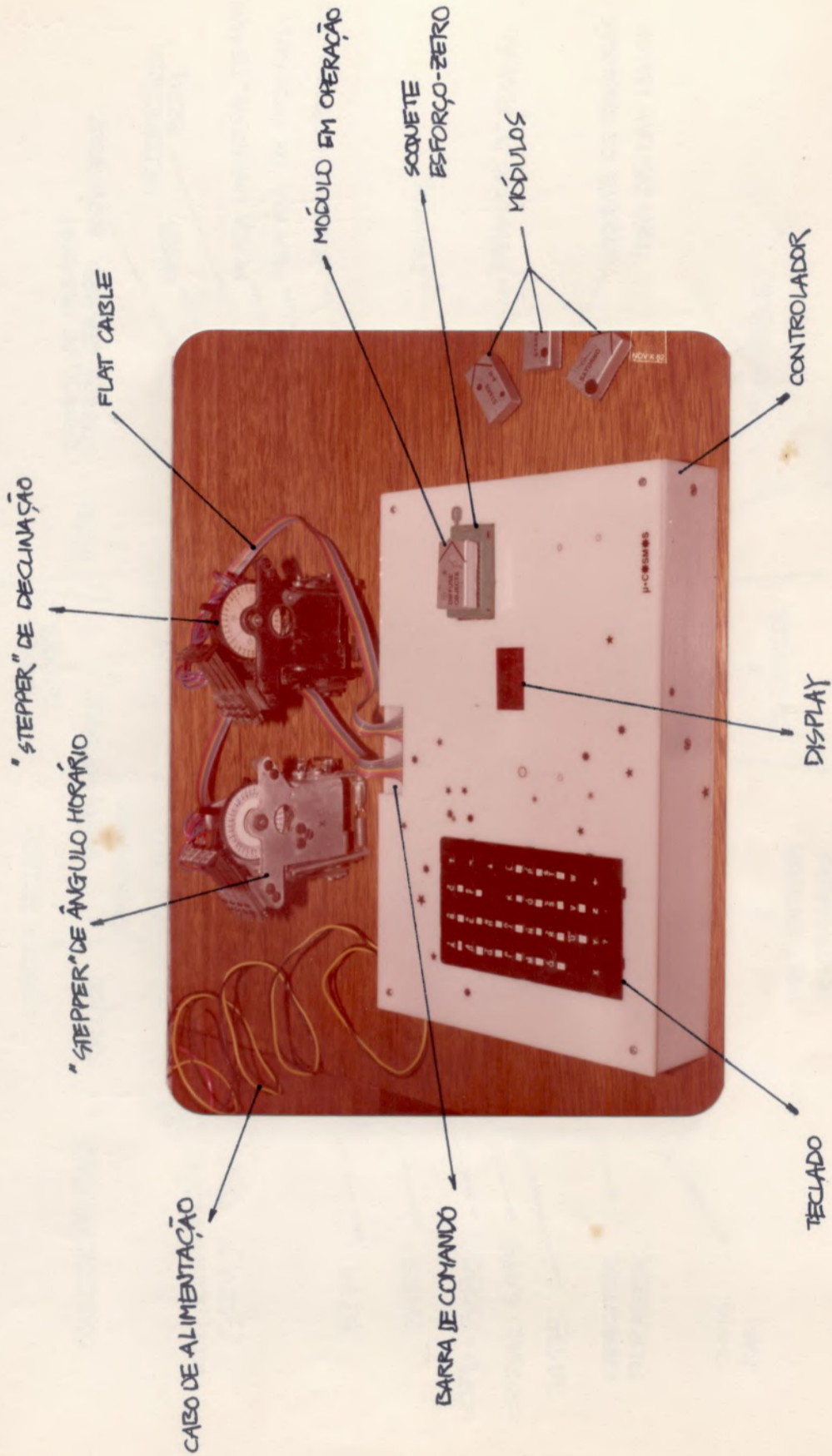

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	31	1								1	1					00	48
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	33	3	1			1		1		1	1					21	49
	34	4						1	1	1						80	49
	35	5	1			1	1	1								A1	41
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	37	7	1							1	1					01	48
	38	8	1			1	1	1	1	1	1					E1	49
	39	9	1			1	1	1		1	1					A1	49
	3A	:															
	3B	;															
200	3C	<					1									20	00
	3D	=					1	1		1	1					30	03
	3E	>					1				1					10	20
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	40	@				1	1	1	1	1	1	1				F7	0A
	41	A				1	1	1	1	1	1	1				CF	03
	42	B				1	1	1	1	1	1	1	1			3F	4A
	43	C				1	1	1	1	1						F3	00
	44	D				1	1	1	1	1						3E	48
	45	E				1	1	1	1	1						F3	01
150	46	F				1	1	1	1	1						C3	01
	47	G				1	1	1	1	1	1					FB	02
	48	H				1	1	1	1	1	1					CC	03
	49	I				1	1	1				1		1		33	48
	4A	J				1	1	1				1		1		63	48
	4B	K						1	1	1			1	1		C0	31
	4C	L				1	1	1	1	1						F0	00
	4D	M				1	1	1	1		1	1				CC	14
	4E	N				1	1	1	1		1		1			CC	24
	4F	O				1	1	1	1	1	1	1				FF	00
100	50	P				1	1	1	1	1	1	1				C7	03
	51	Q				1	1	1	1	1	1	1				FF	20
	52	R				1	1	1	1	1	1	1				C7	23
	53	S				1	1	1	1	1	1	1				BB	03
	54	T				1	1					1		1		03	48
	55	U				1	1	1	1	1						FC	00
	56	V								1	1					C0	90
	57	W				1	1	1	1			1	1			CC	A0
	58	X								1	1	1	1			00	B4
	59	Y								1	1	1				00	54
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	5B	[1				1	1	1				E1	00
	5C	\								1	1					00	24
	5D]				1	1	1	1							1E	00
	5E	^				1	1					1	1			06	90
	5F	←								1	1	1				00	32
	60	SFC														00	00
	61	"														00	00
	62	'						1		1						00	08
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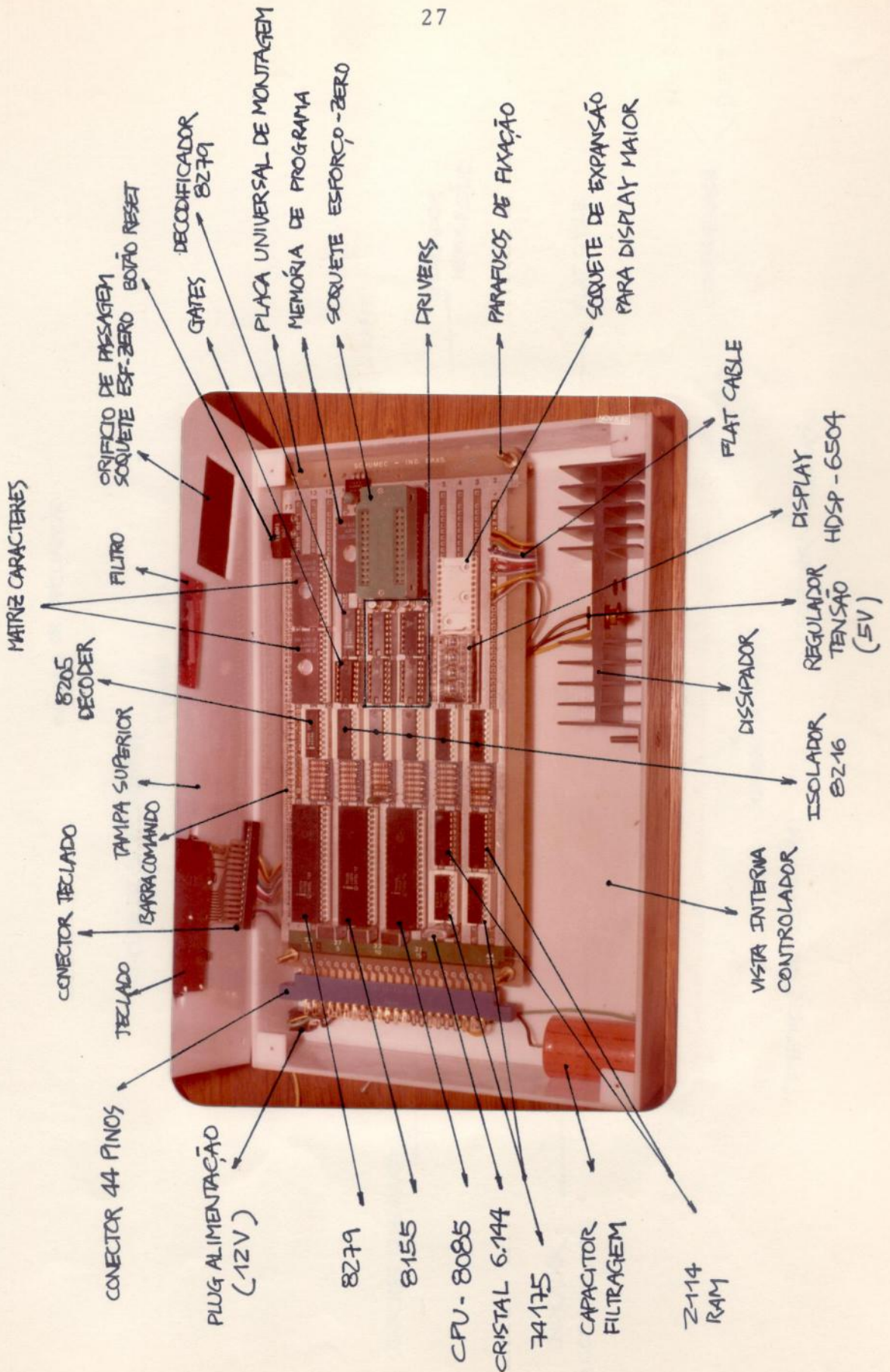
VI. CONCEPÇÃO DO EQUIPAMENTO

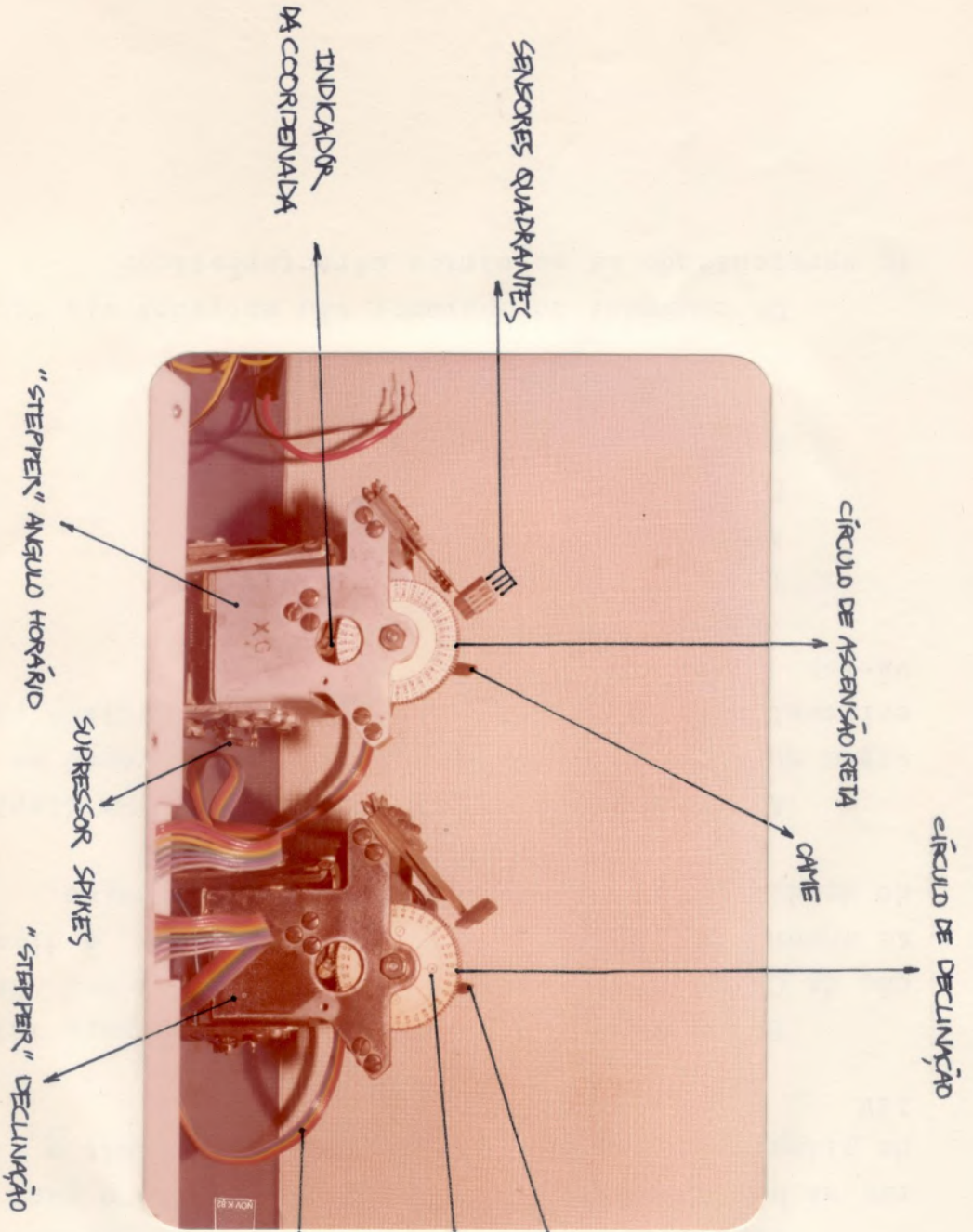
Os circuitos foram montados em placa universal, com os pinos fiados com KAINA possibilitando reconfiguração quando necessária.

Esta pequena placa de 4 unidades permitiu a portabilidade deste equipamento, quando colocado numa caixa de acrílico com cosmética própria. Um teclado fixado na tampa, uma abertura para os flat-cables da barra de comando, uma passagem para a introdução do módulo-library, e um botão acessível externamente para o reset, são características de montagem do equipamento.

Demais detalhes estão nas fotos auto-explicativas mostradas a seguir.







COORDENADA

H = $\varnothing 2140^m$

D = $+40^{\circ} \varnothing \varnothing$

VII. OPERAÇÃO

Para utilização do equipamento deve-se inicialmente proceder com o "cold start" do controlador.

Para tal, instale os flat-cables dos motores e sensores na barra de comando da console. Conecte o pino "banana" de alimentação na lateral posterior da console e ligue os 12V.

Em seguida, aperte o botão de reset para inicialização da CPU de todos os componentes periféricos. Este botão se encontra na lateral posterior da console, à direita, sendo de difícil acesso para evitar reset indevido.

A partir disto já estará circulando no display a mensagem que identifica o equipamento, descrevendo as funções existentes e apresentando o código a ser teclado para ativá-las:

TIME = 1
ATLAS = 2
CALAR = 3
MENU = 4

Os comandos do operador são entrados via teclado, este apresentando as seguintes características:

TECLAS DE CONTROLE

- ↑ seleciona o set de caracteres acima das teclas
- seleciona o set de caracteres sobre as teclas
- ↓ seleciona o set de caracteres abaixo das teclas
- ← cursor usado na edição e correção dos dados

TECLAS ALFANUMÉRICAS

- ↑ 1234567890. =+ - / < > % \$ SPC
- ABCDEFGHIJKLMNOPQRSTUVWXYZ
- ↓ αβγδεζηθκλμνξοηρστυμψω?,

TECLAS MORTAS

3X3 (linha 3 e coluna 3)

7X1 (linha 7 e coluna 1)

A função TIME deve fazer parte do processo de inicialização do controlador, já que a hora sideral local e a hora civil local são utilizadas no processamento de outras funções.

Assim após o reset, teclariamos:

↑1,

já que por default estão selecionados os caracteres sobre as teclas.

O processador ecoará o algarismo 1 e sinalizará o reconhecimento com o apagamento do display, aguardando a entrada de novo comando.

Neste momento, apenas 2 comandos são aceitos pelo processador:

S ou

C ,

sendo o primeiro para acerto da hora sideral local e o último para acerto da hora civil local.

Qualquer caracter (salvo \$) teclado neste momento será ecoado no display, mas somente o C ou S será aceito. O processador responderá com o valor de hora civil ou sideral dependendo do comando ter sido C ou S.

Este valor poderá ser um lixo qualquer ou um valor correto que está sendo consultado.

O formato da apresentação no display é HHMM.

O processador aguardará qualquer alteração que só se concretizará com a substituição de todos os caracteres, mesmo que corretos.

Assim, caso se deseje atualizar a hora sideral, a sequência seria a seguinte:

-S

↑1200\$

Observe que o caracter terminador é o dollar \$, sendo este usado em todos os casos, como terminador dos comandos dentro de uma função ou como terminador da própria função:

De um modo geral teremos:

- terminação de comando com ↑\$

- terminação de função com ↑\$\$

Portanto, para abortar a função TIME bastará abortar o comando em curso, teclando-se \$, e em seguida abortar a própria função, teclando-se outro \$.

Caso nenhum comando esteja em curso, é necessário portanto, apenas um \$.

Resumindo, para a inicialização dos relógios sideral e civil, teríamos a sequência:

↑1

-C

↑1200\$

-S

↑0345\$\$

As horas e minutos são carregados nos registros do processador e os segundos são zerados internamente, imediatamente após a teclagem do \$.

A função ATLAS pressupõe a utilização dos módulos-library.

Assim, coloque o módulo característico do tipo de astro que se deseja observar e tecle:

↑2,

o processador ecoará o algarismo 2 e sinalizará o reconhecimento com o apagamento do display, aguardando a entrada do nome do astro a ser pesquisado no banco de dados.

Neste momento, caso seja teclado o \$, a função é abortada sem se realizar qualquer pesquisa.

Em caso de teclagem do nome do astro, este poderá ter até 4 caracteres e deverá ser terminado com \$ para encerrar comando e iniciar a pesquisa no módulo presente.

Como exemplo, pesquisamos as coordenadas da estrela α Centaurus:

↑2

↓ α •CEN↑\$

No display apareceriam circulando os valores das coordenadas universais - ascensão reta e declinação.

Caso o módulo usado não seja o apropriado ou mesmo não contenha o astro, a mensagem circulando no display informará que o "ASTRO NÃO ESTÁ NO ATLAS".

Esta mensagem é abortada teclando-se o \$ e colocando o equipamento à disposição para uma nova entrada.

Insistindo no mesmo astro, procure o módulo mais adequado, e instale-o no equipamento.

O módulo poderá ser instalado em qualquer momento anterior à teclagem do \$, usado como terminador do nome do astro.

Em função do tipo de astro e da estrutura dos dados de cada módulo, a entrada poderá ser:

- a especificação do astro pelo nome "científico" ou vulgar, pelo código de catálogo (MESSIER, NGC,...) ou pelo nome-propriedade.

- a data, dia e mes (DDMM) para os astros com movimento próprio significativo como planetas, satélites, sol...

Os módulos podem ser trocados durante a operação do equipamento sem perda do processador, de modo que diferentes tipos de astros poderão ser consultados durante a mesma operação.

A função CALAR apresenta todos os comandos operacionais da função ATLAS apenas com resultados diferentes. Após a teclagem do \$ terminador da especificação do astro, é feito o cálculo do ângulo horário do astro, em função da hora sideral e em seguida calado o astro.

Quando a calagem se completar, aparecerão circulando no display as coordenadas ascensão reta e declinação.

Da mesma forma que na função ATLAS, caso o astro não seja encontrado na library, aparecerá no display a mensagem de "ASTRO NÃO ESTÁ NO ATLAS". Com o \$, esta mensagem será abortada, iniciando-se novo ciclo de calagem.

A função MENU vem atender as seguintes necessidades:

- criar uma programação de observação, de modo a automatizar o mais possível uma sequência de observações, como no caso de um observatório com acesso a vários astrônomos ou uma sequência de fotos a serem tomadas no céu com intervalos determinados.

- permitir a calagem de astros que não se encontram na library, como no caso de astros especiais, astros com movimento próprio perceptível que tem posições alteradas a cada dia ou ainda posições ou regiões no céu sem astros associados.

Para entrar na função MENU tecle

+4

Agora pode-se entrar com até 25 astros com o seguinte formato:

HORA DE INÍCIO DA OBSERVAÇÃO	HHMM
HORA DE FIM DA OBSERVAÇÃO	HHMM
HEMISFÉRIO DO ASTRO	'N' ou 'S'
ASCENSÃO RETA DO ASTRO	HHMM
DECLINAÇÃO DO ASTRO	GGMM

Cada dado deve ser terminado com \$ e para abortar a função, o \$ deverá ser o primeiro caracter do dado.

A cada chamada da função MENU, novas observações poderão ser inseridas até que se complete os 25 astros, quando novos dados serão rejeitados. Com o reset, um novo grupo de 25 observações poderá ser inserido.

A execução se dará a partir da liberação da função seguida da teclagem de \$, quando a cada minuto o processador comparará o valor da hora civil com os inícios de observações previstos. Toda vez que existir uma calagem para aquela hora, o astro ou região do céu é posicionado no campo

do instrumento e permanecerá assim até que chegue a hora de fim de observação. Neste momento, desde que o astrônomo tenha dado o aval para o processador - teclando o \$, o instrumento retorna a sua posição de repouso e fica aguardando nova calagem.

Este procedimento continua até esgotar o programa de observação, embora a qualquer instante o operador poderá consultar outras funções, bastando para isso, teclar o seu código.

VIII. NOVAS FACILIDADES

Novos recursos poderão ser acrescentados a este equipamento considerando ainda a capacidade ociosa de memória e processamento deste microcomputador. De sobra ainda temos vários pinos de I/O que podem servir para controle do meio externo.

Dentre as novas facilidades implementáveis, que agora me ocorre, estariam:

1. Criação de novas funções como a MAPA já idealizada, que serviria para mapear uma região do céu, determinando as coordenadas dos astros ou posições no céu, para as quais estaria apontado o instrumento de observação.

2. Comando de movimentação da cúpula do observatório em conjugação com a calagem dos astros, garantindo o posicionamento correto da janela de observação da cúpula.

3. Comandos manuais de calagem dentro da função CALAR .

4. Comandos especiais para controle de obturação eletrônica de diafragma de câmeras fotográficas.

Muitos outros poderiam ser listados visando cada vez mais automatizar as operações envolvidas na preparação para o registro e observação dos astros.

Para isso devemos considerar uma disponibilidade de

memória de programa da ordem de 400 bytes, de 12 pinos I/O, de mais de 512 bytes de memória de dados e pinos de decodificação que permitiriam expandir a memória de programa e/ou dados e o display alfanumérico para mais 4 caracteres, facilitando o processo conversacional de outras funções.

7. Inclusão de Caracteres de Pontuação

Para a inclusão de caracteres de pontuação, o software providenciou a representação dos dados no display, sendo incluído o ponto decimal nas horas, para melhor compreensão e leitura cada vez mais necessária nas operações.

Faz tal alteração acrescentar os 12 bytes a seguir ao array de caracteres para os caracteres pontuação, e acrescentar ao display o ponto decimal a esquerda de cada número de 1 a 999999.

Deve-se trocar os caracteres de pontuação, e acrescentar de alguns caracteres de pontuação que não são considerados no sistema de pontuação.

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IX. PESQUISA COMPLEMENTAR

A continuação deste trabalho poderá seguir nas direções:

1. aprimoramento de alguns detalhes de projeto.
2. inclusão de novas facilidades.

Quanto ao item 1, um ponto que tornaria cômoda a apresentação dos dados no display, seria incluir o ponto decimal nas horas, nas coordenadas e talvez onde se fizer necessário nas mensagens.

Para tal bastaria aproveitar os 128 bytes vagos na matriz de caracteres para os caracteres pontuados, já que neste display o ponto é colocado a esquerda de um conjunto de 7 segmentos.

Deve-se trocar na matriz de caracteres, a codificação de algarismos de modo a que eles ocupem o conjunto de 7 segmentos da direita.

Deve-se acrescentar ao circuito um driver a transistor sobre a linha A3 (pino 28) da pastilha 8279, com emissor ligado ao anodo do segmento DP (pino 2) do HDSP-6504 e coletor ligado ao +5V através de um resistor limitador.

Assim toda vez que se fizer necessário a colocação do ponto decimal junto ao algarismo, o software providenciará uma máscara do código ASCII com 080 de modo a endereçar o segundo grupo de 128 bytes da matriz de caracteres. Neste grupo estarão repetidas as codificações de todos os caracteres,

fundamentalmente os algarismos (de B0 a B9), de modo que no display teremos o algarismo como normalmente apareceria, mais o ponto decimal aceso pelo acionamento, por fora da matriz, da linha A₃ sobre a driver discreto.

Quanto ao item 2, algumas das novas facilidades seriam aquelas listadas no capítulo anterior.

Uma realização importante seria a conversão das coordenadas equatoriais em altoazimutais, podendo servir de base para uma calagem de grandes telescópios, onde a mecânica exige uma montagem altoazimutal. Outra aplicação seria a adaptação de mecanismos simples, usados em pequenas lunetas, máquinas fotográficas para fundo de céu e binóculos caçadores de cometa, para funcionarem com calagem e acompanhamento automáticos, usando-se a conversão de coordenadas.

Considerando-se que esta conversão envolve transformação na base de funções trigonométricas e que os microprocessadores são eficientes em controle de processos mas relativamente lentos em funções matemáticas mais complexas, talvez se faça necessário o uso de um coo-processador matemático, tipo AMD 9511, compatível com a estrutura deste processador e com operadores matemáticos os mais diversos. Outra solução é a de conseguir-se implementar um algoritmo utilizando soma e subtração, eficiente e com precisão de ordem de minuto.

X. CONCLUSÕES

As conclusões são tiradas a partir da realização prática deste trabalho, de seu desempenho operacional e de suas vantagens na operação de instrumentos de observação.

Quanto às vantagens listamos as seguintes:

1. Alto grau de automatização -
2. Centralização de comandos
3. Baixo custo e alta confiabilidade
4. Portabilidade
5. Baixo consumo de fonte única
6. Fácil operação
7. Comunicação Homem-Máquina em linguagem de alto nível

Quanto ao desempenho operacional o equipamento mostrou-se eficiente, com respostas rápidas aos comandos do operador, minimizando os comandos errados através de comandos de edição, tornando a operação segura e conversacional.

Concluimos que a realização prática deste trabalho mostrou a importância do uso de controle de processos aplicados à astronomia onde cada vez mais se faz necessária a automação e o processamento dos dados provenientes de coletores, desde um pequeno teodolito até grandes redes de radio-telescópios.

CHAPTER 2 THE INSTRUCTION SET

2.1 WHAT THE INSTRUCTION SET IS

A computer, no matter how sophisticated, can do only what it is instructed to do. A program is a sequence of instructions, each of which is recognized by the computer and causes it to perform an operation. Once a program is stored in memory space that is accessible to your GPU, you may run that same sequence of instructions as often as you wish to solve the same problem or to do the same function. The set of instructions to which the NEBSA CPU will respond is permanently fixed in the design of the chip.

Each computer instruction allows you to utilize the performance of a specific chip. The NEBSA implements a group of instructions that move data between registers, between a register and memory, and between a register and an I/O port. It also has arithmetic and logic instructions, conditional and unconditional branch instructions, and machine control instructions. The CPU recognizes these instructions only when they are coded in binary form.

2.2 SYMBOLS AND ABBREVIATIONS

The following symbols and abbreviations are used in the subsequent description of the NEBSA instructions.

SYMBOLS	MEANING	RF
accumulator	Register A	
addr	16-bit address quantity	
data	8-bit quantity	
data 16	16-bit data quantity	
byte 2	The second byte of the instruction	
byte 3	The third byte of the instruction	
port	8-bit address of an I/O device	
(R)2	One of the registers A,B,C, D,E,H,L	

ADDRESS

The bit pattern designating one of the registers A,B,C,D, E,H,L (DDD = destination, DSS = source).

DDD or SSS	REGISTER NAME
111	A
000	B
001	C
010	D
011	E
100	H
101	L

ANEXO I

One of the register pairs
B represents the low-order register and C as the low-order register.

D represents the high-order register and E as the low-order register.

H represents the high-order register and L as the low-order register.

SP represents the stack pointer register.

The bit pattern designating one of the register pairs B,C,H,SP.

RP	REGISTER PAIR
00	B-C
01	D-E
10	H-L
11	SP

The first (high-order) register of a designated register pair.

The second (low-order) register of a designated register pair.

CHAPTER 5 THE INSTRUCTION SET

5.1 WHAT THE INSTRUCTION SET IS

A computer, no matter how sophisticated, can do only what it is instructed to do. A program is a sequence of instructions, each of which is recognized by the computer and causes it to perform an operation. Once a program is placed in memory space that is accessible to your CPU, you may run that same sequence of instructions as often as you wish to solve the same problem or to do the same function. The set of instructions to which the 8085A CPU will respond is permanently fixed in the design of the chip.

Each computer instruction allows you to initiate the performance of a specific operation. The 8085A implements a group of instructions that move data between registers, between a register and memory, and between a register and an I/O port. It also has arithmetic and logic instructions, conditional and unconditional branch instructions, and machine control instructions. The CPU recognizes these instructions only when they are coded in binary form.

5.2 SYMBOLS AND ABBREVIATIONS:

The following symbols and abbreviations are used in the subsequent description of the 8085A instructions:

SYMBOLS	MEANING
accumulator	Register A
addr	16-bit address quantity
data	8-bit quantity
data 16	16-bit data quantity
byte 2	The second byte of the instruction
byte 3	The third byte of the instruction
port	8-bit address of an I/O device
r,r1,r2	One of the registers A,B,C,D,E,H,L

DDD,SSS

The bit pattern designating one of the registers A,B,C,D,E,H,L (DDD = destination, SSS = source):

DDD or SSS	REGISTER NAME
111	A
000	B
001	C
010	D
011	E
100	H
101	L

rp

One of the register pairs:

B represents the B,C pair with B as the high-order register and C as the low-order register;

D represents the D,E pair with D as the high-order register and E as the low-order register;

H represents the H,L pair with H as the high-order register and L as the low-order register;

SP represents the 16-bit stack pointer register.

The bit pattern designating one of the register pairs B,D,H,SP:

RP	REGISTER PAIR
00	B-C
01	D-E
10	H-L
11	SP

The first (high-order) register of a designated register pair.

The second (low-order) register of a designated register pair.

THE INSTRUCTION SET

PC	16-bit program counter register (PCH and PCL are used to refer to the high-order and low-order 8 bits respectively).
SP	16-bit stack pointer register (SPH and SPL are used to refer to the high-order and low-order 8 bits respectively).
r _m	Bit m of the register r (bits are number 7 through 0 from left to right).
LABEL	16-bit address of subroutine. The condition flags:
Z	Zero
S	Sign
P	Parity
CY	Carry
AC	Auxiliary Carry
()	The contents of the memory location or registers enclosed in the parentheses.
-	"Is transferred to"
∧	Logical AND
∨	Exclusive OR
∧	Inclusive OR
+	Addition
-	Two's complement subtraction
*	Multiplication
-	"Is exchanged with"
—	The one's complement (e.g., $\overline{(A)}$)
n	The restart number 0 through 7
NNN	The binary representation 000 through 111 for restart number 0 through 7 respectively.

The instruction set encyclopedia is a detailed description of the 8085A instruction set. Each instruction is described in the following manner:

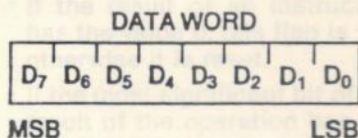
1. The MCS-85 macro assembler format, consisting of the instruction mnemonic and operand fields, is printed in **BOLDFACE** on the first line.
2. The name of the instruction is enclosed in parentheses following the mnemonic.
3. The next lines contain a symbolic description of what the instruction does.
4. This is followed by a narrative description of the operation of the instruction.

5. The boxes describe the binary codes that comprise the machine instruction.
6. The last four lines contain information about the execution of the instruction. The number of machine cycles and states required to execute the instruction are listed first. If the instruction has two possible execution times, as in a conditional jump, both times are listed, separated by a slash. Next, data addressing modes are listed if applicable. The last line lists any of the five flags that are affected by the execution of the instruction.

5.3 INSTRUCTION AND DATA FORMATS

Memory used in the MCS-85 system is organized in 8-bit bytes. Each byte has a unique location in physical memory. That location is described by one of a sequence of 16-bit binary addresses. The 8085A can address up to 64K ($K = 1024$, or 2^{10} ; hence, 64K represents the decimal number 65,536) bytes of memory, which may consist of both random-access, read-write memory (RAM) and read-only memory (ROM), which is also random-access.

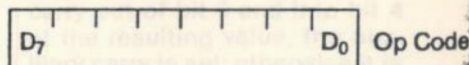
Data in the 8085A is stored in the form of 8-bit binary integers:



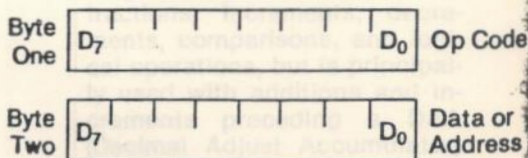
When a register or data word contains a binary number, it is necessary to establish the order in which the bits of the number are written. In the Intel 8085A, BIT 0 is referred to as the **Least Significant Bit (LSB)**, and BIT 7 (of an 8-bit number) is referred to as the **Most Significant Bit (MSB)**.

An 8085A program instruction may be one, two or three bytes in length. Multiple-byte instructions must be stored in successive memory locations; the address of the first byte is always used as the address of the instruction. The exact instruction format will depend on the particular operation to be executed.

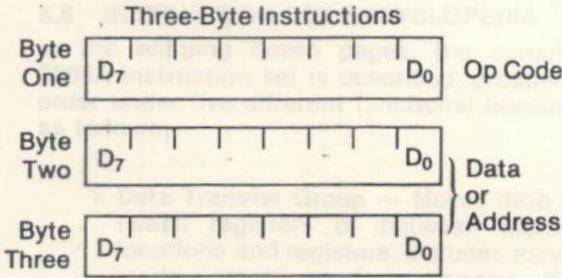
Single Byte Instructions



Two-Byte Instructions



THE INSTRUCTION SET



5.4 ADDRESSING MODES:

Often the data that is to be operated on is stored in memory. When multi-byte numeric data is used, the data, like instructions, is stored in successive memory locations, with the least significant byte first, followed by increasingly significant bytes. The 8085A has four different modes for addressing data stored in memory or in registers:

- **Direct** — Bytes 2 and 3 of the instruction contain the exact memory address of the data item (the low-order bits of the address are in byte 2, the high-order bits in byte 3).
- **Register** — The instruction specifies the register or register pair in which the data is located.
- **Register Indirect** — The instruction specifies a register pair which contains the memory address where the data is located (the high-order bits of the address are in the first register of the pair the low-order bits in the second).
- **Immediate** — The instruction contains the data itself. This is either an 8-bit quantity or a 16-bit quantity (least significant byte first, most significant byte second).

Unless directed by an interrupt or branch instruction, the execution of instructions proceeds through consecutively increasing memory locations. A branch instruction can specify the address of the next instruction to be executed in one of two ways:

- **Direct** — The branch instruction contains the address of the next instruction to be executed. (Except for the 'RST' instruction, byte 2 contains the low-order address and byte 3 the high-order address.)

- **Register Indirect** — The branch instruction indicates a register-pair which contains the address of the next instruction to be executed. (The high-order bits of the address are in the first register of the pair, the low-order bits in the second.)

The RST instruction is a special one-byte call instruction (usually used during interrupt sequences). RST includes a three-bit field; program control is transferred to the instruction whose address is eight times the contents of this three-bit field.

5.5 CONDITION FLAGS:

There are five condition flags associated with the execution of instructions on the 8085A. They are Zero, Sign, Parity, Carry, and Auxiliary Carry. Each is represented by a 1-bit register (or flip-flop) in the CPU. A flag is set by forcing the bit to 1; it is reset by forcing the bit to 0.

Unless indicated otherwise, when an instruction affects a flag, it affects it in the following manner:

- Zero:** If the result of an instruction has the value 0, this flag is set; otherwise it is reset.
- Sign:** If the most significant bit of the result of the operation has the value 1, this flag is set; otherwise it is reset.
- Parity:** If the modulo 2 sum of the bits of the result of the operation is 0, (i.e., if the result has even parity), this flag is set; otherwise it is reset (i.e., if the result has odd parity).
- Carry:** If the instruction resulted in a carry (from addition), or a borrow (from subtraction or a comparison) out of the high-order bit, this flag is set; otherwise it is reset.

Auxiliary Carry: If the instruction caused a carry out of bit 3 and into bit 4 of the resulting value, the auxiliary carry is set; otherwise it is reset. This flag is affected by single-precision additions, subtractions, increments, decrements, comparisons, and logical operations, but is principally used with additions and increments preceding a DAA (Decimal Adjust Accumulator) instruction.

THE INSTRUCTION SET

5.6 INSTRUCTION SET ENCYCLOPEDIA

In the ensuing dozen pages, the complete 8085A instruction set is described, grouped in order under five different functional headings, as follows:

1. **Data Transfer Group** — Moves data between registers or between memory locations and registers. Includes moves, loads, stores, and exchanges. (See below.)
2. **Arithmetic Group** — Adds, subtracts, increments, or decrements data in registers or memory. (See page 5-13.)
3. **Logic Group** — ANDs, ORs, XORs, compares, rotates, or complements data in registers or between memory and a register. (See page 5-16.)
4. **Branch Group** — Initiates conditional or unconditional jumps, calls, returns, and restarts. (See page 5-20.)
5. **Stack, I/O, and Machine Control Group** — Includes instructions for maintaining the stack, reading from input ports, writing to output ports, setting and reading interrupt masks, and setting and clearing flags. (See page 5-22.)

The formats described in the encyclopedia reflect the assembly language processed by Intel-supplied assembler, used with the Inteltec® development systems.

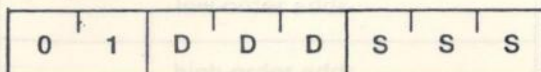
5.6.1 Data Transfer Group

This group of instructions transfers data to and from registers and memory. **Condition flags are not affected by any instruction in this group.**

MOV r1, r2 (Move Register)

(r1) — (r2)

The content of register r2 is moved to register r1.

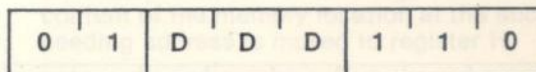


Cycles: 1
 States: 4 (8085), 5 (8080)
 Addressing: register
 Flags: none

MOV r, M (Move from memory)

(r) — ((H) (L))

The content of the memory location, whose address is in registers H and L, is moved to register r.

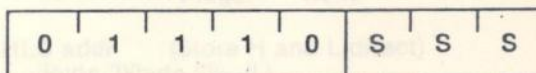


Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: none

MOV M, r (Move to memory)

((H) (L)) — (r)

The content of register r is moved to the memory location whose address is in registers H and L.

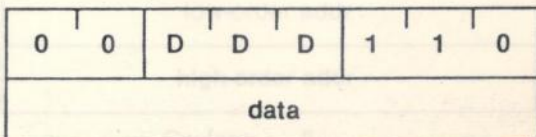


Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: none

MVI r, data (Move Immediate)

(r) — (byte 2)

The content of byte 2 of the instruction is moved to register r.

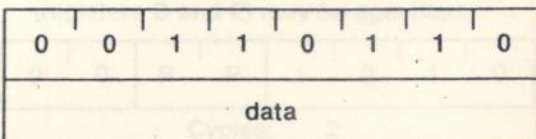


Cycles: 2
 States: 7
 Addressing: immediate
 Flags: none

MVI M, data (Move to memory immediate)

((H) (L)) — (byte 2)

The content of byte 2 of the instruction is moved to the memory location whose address is in registers H and L.



Cycles: 3
 States: 10
 Addressing: immed./reg. indirect
 Flags: none

THE INSTRUCTION SET

LXI rp, data 16 (Load register pair immediate)

(rh) — (byte 3),

(rl) — (byte 2)

Byte 3 of the instruction is moved into the high-order register (rh) of the register pair rp. Byte 2 of the instruction is moved into the low-order register (rl) of the register pair rp.

0	0	R	P	0	0	0	1
low-order data							
high-order data							

Cycles: 3
 States: 10
 Addressing: immediate
 Flags: none

LDA addr (Load Accumulator direct)

(A) — ((byte 3)(byte 2))

The content of the memory location, whose address is specified in byte 2 and byte 3 of the instruction, is moved to register A.

0	0	1	1	1	0	1	0
low-order addr							
high-order addr							

Cycles: 4
 States: 13
 Addressing: direct
 Flags: none

STA addr (Store Accumulator direct)

((byte 3)(byte 2)) — (A)

The content of the accumulator is moved to the memory location whose address is specified in byte 2 and byte 3 of the instruction.

0	0	1	1	0	0	1	0
low-order addr							
high-order addr							

Cycles: 4
 States: 13
 Addressing: direct
 Flags: none

LHLD addr (Load H and L direct)

(L) — ((byte 3)(byte 2))

(H) — ((byte 3)(byte 2) + 1)

The content of the memory location, whose address is specified in byte 2 and byte 3 of the instruction, is moved to register L. The content of the memory location at the succeeding address is moved to register H.

0	0	1	0	1	0	1	0
low-order addr							
high-order addr							

Cycles: 5
 States: 16
 Addressing: direct
 Flags: none

SHLD addr (Store H and L direct)

((byte 3)(byte 2)) — (L)

((byte 3)(byte 2) + 1) — (H)

The content of register L is moved to the memory location whose address is specified in byte 2 and byte 3. The content of register H is moved to the succeeding memory location.

0	0	1	0	0	0	1	0
low-order addr							
high-order addr							

Cycles: 5
 States: 16
 Addressing: direct
 Flags: none

LDAX rp (Load accumulator indirect)

(A) — ((rp))

The content of the memory location, whose address is in the register pair rp, is moved to register A. Note: only register pairs rp = B (registers B and C) or rp = D (registers D and E) may be specified.

0	0	R	P	1	0	1	0
---	---	---	---	---	---	---	---

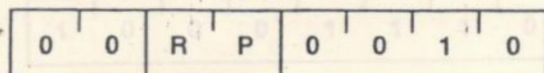
Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: none

THE INSTRUCTION SET

STAX rp (Store accumulator indirect)

((rp)) - (A)

The content of register A is moved to the memory location whose address is in the register pair rp. Note: only register pairs rp=B (registers B and C) or rp=D (registers D and E) may be specified.



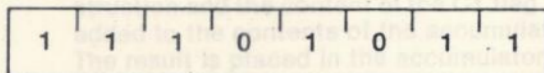
Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: none

XCHG (Exchange H and L with D and E)

(H) ↔ (D)

(L) ↔ (E)

The contents of registers H and L are exchanged with the contents of registers D and E.



Cycles: 1
 States: 4
 Addressing: register
 Flags: none

5.6.2 Arithmetic Group

This group of instructions performs arithmetic operations on data in registers and memory.

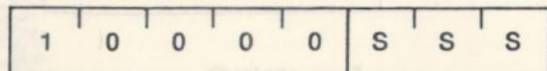
Unless indicated otherwise, all instructions in this group affect the Zero, Sign, Parity, Carry, and Auxiliary Carry flags according to the standard rules.

All subtraction operations are performed via two's complement arithmetic and set the carry flag to one to indicate a borrow and clear it to indicate no borrow.

ADD r (Add Register)

(A) - (A) + (r)

The content of register r is added to the content of the accumulator. The result is placed in the accumulator.

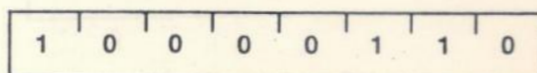


Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

ADD M (Add memory)

(A) - (A) + ((H) (L))

The content of the memory location whose address is contained in the H and L registers is added to the content of the accumulator. The result is placed in the accumulator.

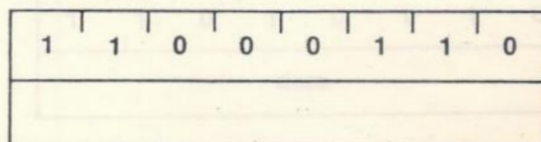


Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

ADI data (Add immediate)

(A) - (A) + (byte 2)

The content of the second byte of the instruction is added to the content of the accumulator. The result is placed in the accumulator.

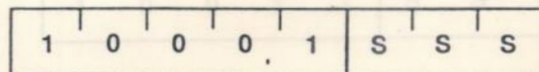


Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

ADC r (Add Register with carry)

(A) - (A) + (r) + (CY)

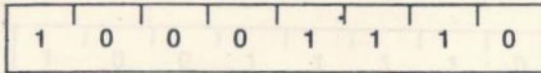
The content of register r and the content of the carry bit are added to the content of the accumulator. The result is placed in the accumulator.



Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

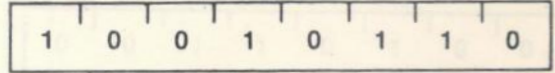
THE INSTRUCTION SET

ADC M (Add memory with carry)
 $(A) - (A) + ((H) (L)) + (CY)$
 The content of the memory location whose address is contained in the H and L registers and the content of the CY flag are added to the accumulator. The result is placed in the accumulator.



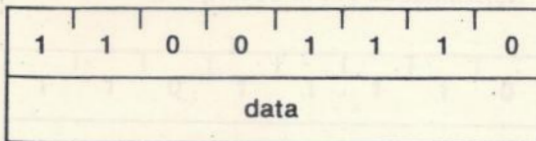
Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

SUB M (Subtract memory)
 $(A) - (A) - ((H) (L))$
 The content of the memory location whose address is contained in the H and L registers is subtracted from the content of the accumulator. The result is placed in the accumulator.



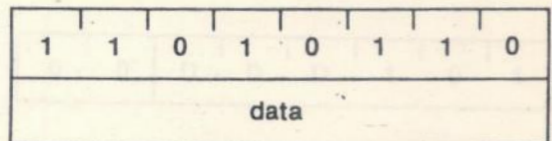
Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

ACI data (Add immediate with carry)
 $(A) - (A) + (\text{byte 2}) + (CY)$
 The content of the second byte of the instruction and the content of the CY flag are added to the contents of the accumulator. The result is placed in the accumulator.



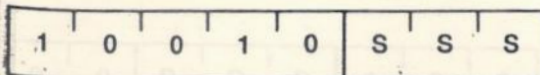
Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

SUI data (Subtract immediate)
 $(A) - (A) - (\text{byte 2})$
 The content of the second byte of the instruction is subtracted from the content of the accumulator. The result is placed in the accumulator.



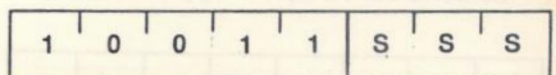
Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

SUB r (Subtract Register)
 $(A) - (A) - (r)$
 The content of register r is subtracted from the content of the accumulator. The result is placed in the accumulator.



Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

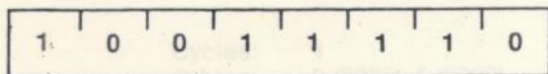
SBB r (Subtract Register with borrow)
 $(A) - (A) - (r) - (CY)$
 The content of register r and the content of the CY flag are both subtracted from the accumulator. The result is placed in the accumulator.



Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

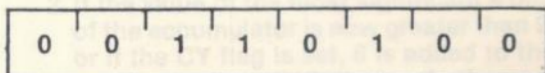
THE INSTRUCTION SET

SBB M (Subtract memory with borrow)
 $(A) - (A) - ((H) (L)) - (CY)$
 The content of the memory location whose address is contained in the H and L registers and the content of the CY flag are both subtracted from the accumulator. The result is placed in the accumulator.



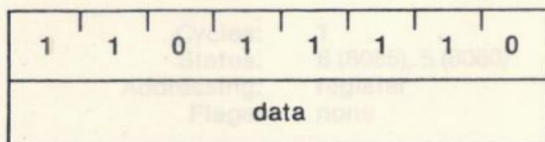
Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

INR M (Increment memory)
 $((H) (L)) - ((H) (L)) + 1$
 The content of the memory location whose address is contained in the H and L registers is incremented by one. Note: All condition flags **except CY** are affected.



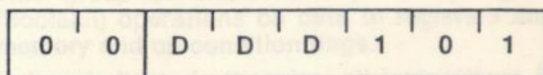
Cycles: 3
 States: 10
 Addressing: reg. indirect
 Flags: Z,S,P,AC

SBI data (Subtract immediate with borrow)
 $(A) - (A) - (\text{byte } 2) - (CY)$
 The contents of the second byte of the instruction and the contents of the CY flag are both subtracted from the accumulator. The result is placed in the accumulator.



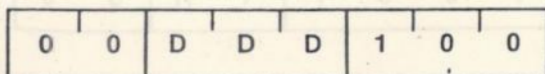
Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

DCR r (Decrement Register)
 $(r) - (r) - 1$
 The content of register r is decremented by one. Note: All condition flags **except CY** are affected.



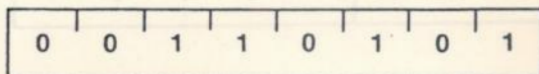
Cycles: 1
 States: 4 (8085), 5 (8080)
 Addressing: register
 Flags: Z,S,P,AC

INR r (Increment Register)
 $(r) - (r) + 1$
 The content of register r is incremented by one. Note: All condition flags **except CY** are affected.



Cycles: 1
 States: 4 (8085), 5 (8080)
 Addressing: register
 Flags: Z,S,P,AC

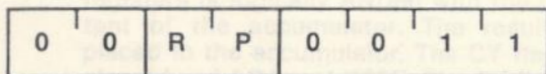
DCR M (Decrement memory)
 $((H) (L)) - ((H) (L)) - 1$
 The content of the memory location whose address is contained in the H and L registers is decremented by one. Note: All condition flags **except CY** are affected.



Cycles: 3
 States: 10
 Addressing: reg. indirect
 Flags: Z,S,P,AC

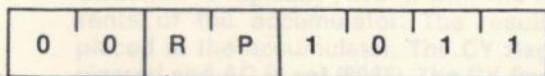
THE INSTRUCTION SET

INX rp (Increment register pair)
 $(rh)(rl) \leftarrow (rh)(rl) + 1$
 The content of the register pair *rp* is incremented by one. Note: **No condition flags are affected.**



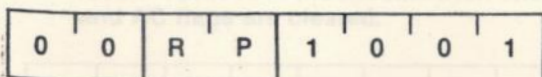
Cycles: 1
 States: 6 (8085), 5 (8080)
 Addressing: register
 Flags: none

DCX rp (Decrement register pair)
 $(rh)(rl) \leftarrow (rh)(rl) - 1$
 The content of the register pair *rp* is decremented by one. Note: **No condition flags are affected.**



Cycles: 1
 States: 6 (8085), 5 (8080)
 Addressing: register
 Flags: none

DAD rp (Add register pair to H and L)
 $(H)(L) \leftarrow (H)(L) + (rh)(rl)$
 The content of the register pair *rp* is added to the content of the register pair H and L. The result is placed in the register pair H and L. Note: **Only the CY flag is affected.** It is set if there is a carry out of the double precision add; otherwise it is reset.

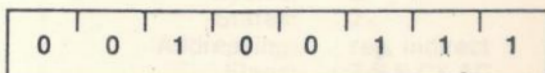


Cycles: 3
 States: 10
 Addressing: register
 Flags: CY

DAA (Decimal Adjust Accumulator)
 The eight-bit number in the accumulator is adjusted to form two four-bit Binary-Coded-Decimal digits by the following process:

1. If the value of the least significant 4 bits of the accumulator is greater than 9 or if the AC flag is set, 6 is added to the accumulator.
2. If the value of the most significant 4 bits of the accumulator is now greater than 9, or if the CY flag is set, 6 is added to the most significant 4 bits of the accumulator.

NOTE: All flags are affected.



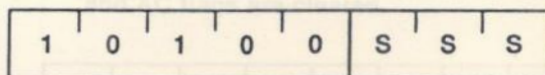
Cycles: 1
 States: 4
 Flags: Z,S,P,CY,AC

5.6.3 Logical Group

This group of instructions performs logical (Boolean) operations on data in registers and memory and on condition flags.

Unless indicated otherwise, all instructions in this group affect the Zero, Sign, Parity, Auxiliary Carry, and Carry flags according to the standard rules.

ANA r (AND Register)
 $(A) \leftarrow (A) \wedge (r)$
 The content of register *r* is logically ANDed with the content of the accumulator. The result is placed in the accumulator. **The CY flag is cleared and AC is set (8085). The CY flag is cleared and AC is set to the OR'ing of bits 3 of the operands (8080).**



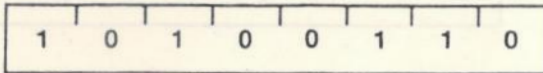
Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

THE INSTRUCTION SET

ANA M (AND memory)

$(A) - (A) \wedge ((H) (L))$

The contents of the memory location whose address is contained in the H and L registers is logically ANDed with the content of the accumulator. The result is placed in the accumulator. **The CY flag is cleared and AC is set (8085). The CY flag is cleared and AC is set to the OR'ing of bits 3 of the operands (8080).**

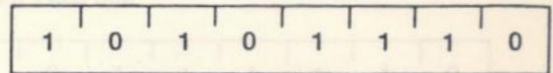


Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

XRA M (Exclusive OR Memory)

$(A) - (A) \vee ((H) (L))$

The content of the memory location whose address is contained in the H and L registers is exclusive-OR'd with the content of the accumulator. The result is placed in the accumulator. **The CY and AC flags are cleared.**

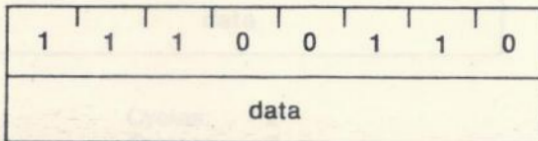


Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

ANI data (AND immediate)

$(A) - (A) \wedge (\text{byte } 2)$

The content of the second byte of the instruction is logically ANDed with the contents of the accumulator. The result is placed in the accumulator. **The CY flag is cleared and AC is set (8085). The CY flag is cleared and AC is set to the OR'ing of bits 3 of the operands (8080).**

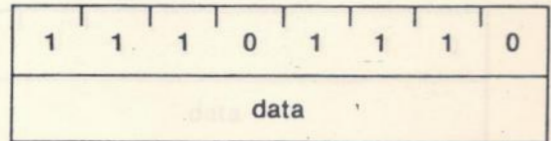


Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

XRI data (Exclusive OR immediate)

$(A) - (A) \vee (\text{byte } 2)$

The content of the second byte of the instruction is exclusive-OR'd with the content of the accumulator. The result is placed in the accumulator. **The CY and AC flags are cleared.**

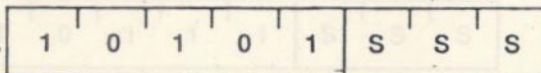


Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

XRA r (Exclusive OR Register)

$(A) - (A) \vee (r)$

The content of register r is exclusive-OR'd with the content of the accumulator. The result is placed in the accumulator. **The CY and AC flags are cleared.**

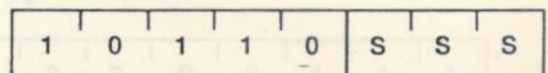


Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

ORA r (OR Register)

$(A) - (A) \vee (r)$

The content of register r is inclusive-OR'd with the content of the accumulator. The result is placed in the accumulator. **The CY and AC flags are cleared.**



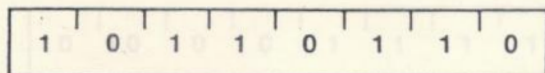
Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

THE INSTRUCTION SET

ORA M (OR memory)

(A) - (A) V ((H) (L))

The content of the memory location whose address is contained in the H and L registers is inclusive-OR'd with the content of the accumulator. The result is placed in the accumulator. **The CY and AC flags are cleared.**

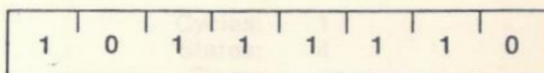


Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

CMP M (Compare memory)

(A) - ((H) (L))

The content of the memory location whose address is contained in the H and L registers is subtracted from the accumulator. The accumulator remains unchanged. The condition flags are set as a result of the subtraction. **The Z flag is set to 1 if (A) = ((H) (L)). The CY flag is set to 1 if (A) < ((H) (L)).**

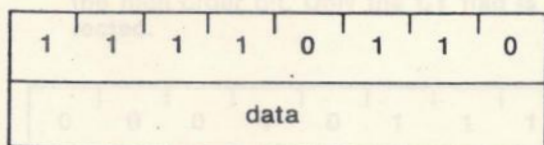


Cycles: 2
 States: 7
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

ORI data (OR Immediate)

(A) - (A) V (byte 2)

The content of the second byte of the instruction is inclusive-OR'd with the content of the accumulator. The result is placed in the accumulator. **The CY and AC flags are cleared.**

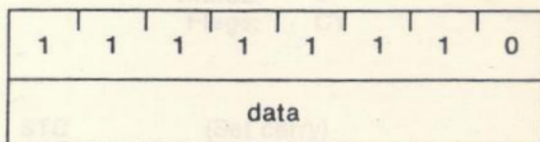


Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

CPI data (Compare immediate)

(A) - (byte 2)

The content of the second byte of the instruction is subtracted from the accumulator. The condition flags are set by the result of the subtraction. **The Z flag is set to 1 if (A) = (byte 2). The CY flag is set to 1 if (A) < (byte 2).**

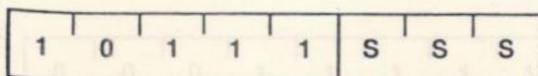


Cycles: 2
 States: 7
 Addressing: immediate
 Flags: Z,S,P,CY,AC

CMP r (Compare Register)

(A) - (r)

The content of register r is subtracted from the accumulator. The accumulator remains unchanged. The condition flags are set as a result of the subtraction. **The Z flag is set to 1 if (A) = (r). The CY flag is set to 1 if (A) < (r).**

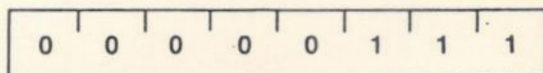


Cycles: 1
 States: 4
 Addressing: register
 Flags: Z,S,P,CY,AC

RLC (Rotate left)

$(A_{n+1}) - (A_n); (A_0) - (A_7)$
 (CY) - (A_7)

The content of the accumulator is rotated left one position. The low order bit and the CY flag are both set to the value shifted out of the high order bit position. **Only the CY flag is affected.**



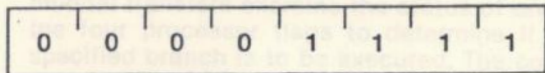
Cycles: 1
 States: 4
 Flags: CY

THE INSTRUCTION SET

RRC (Rotate right)

$(A_n) \rightarrow (A_{n+1}); (A_7) \rightarrow (A_0)$
 $(CY) \rightarrow (A_0)$

The content of the accumulator is rotated right one position. The high order bit and the CY flag are both set to the value shifted out of the low order bit position. **Only the CY flag is affected.**

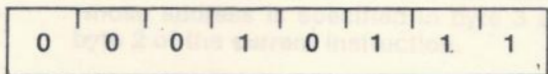


Cycles: 1
 States: 4
 Flags: CY

RAL (Rotate left through carry)

$(A_{n+1}) \leftarrow (A_n); (CY) \leftarrow (A_7)$
 $(A_0) \leftarrow (CY)$

The content of the accumulator is rotated left one position through the CY flag. The low order bit is set equal to the CY flag and the CY flag is set to the value shifted out of the high order bit. **Only the CY flag is affected.**

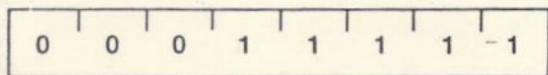


Cycles: 1
 States: 4
 Flags: CY

RAR (Rotate right through carry)

$(A_n) \rightarrow (A_{n+1}); (CY) \rightarrow (A_0)$
 $(A_7) \rightarrow (CY)$

The content of the accumulator is rotated right one position through the CY flag. The high order bit is set to the CY flag and the CY flag is set to the value shifted out of the low order bit. **Only the CY flag is affected.**

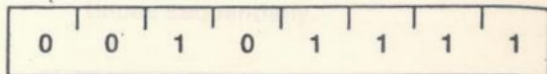


Cycles: 1
 States: 4
 Flags: CY

CMA (Complement accumulator)

$(A) \rightarrow (\bar{A})$

The contents of the accumulator are complemented (zero bits become 1, one bits become 0). **No flags are affected.**

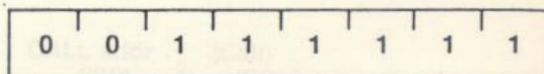


Cycles: 1
 States: 4
 Flags: none

CMC (Complement carry)

$(CY) \rightarrow (\bar{CY})$

The CY flag is complemented. **No other flags are affected.**

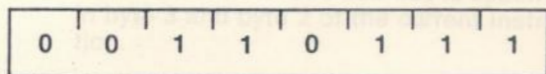


Cycles: 1
 States: 4
 Flags: CY

STC (Set carry)

$(CY) = 1$

The CY flag is set to 1. **No other flags are affected.**



Cycles: 1
 States: 4
 Flags: CY

THE INSTRUCTION SET

5.6.4 Branch Group

This group of instructions alter normal sequential program flow.

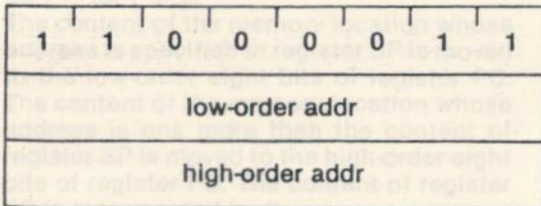
Condition flags are not affected by any instruction in this group.

The two types of branch instructions are unconditional and conditional. Unconditional transfers simply perform the specified operation on register PC (the program counter). Conditional transfers examine the status of one of the four processor flags to determine if the specified branch is to be executed. The conditions that may be specified are as follows:

CONDITION	CCC
NZ — not zero (Z = 0)	000
Z — zero (Z = 1)	001
NC — no carry (CY = 0)	010
C — carry (CY = 1)	011
PO — parity odd (P = 0)	100
PE — parity even (P = 1)	101
P — plus (S = 0)	110
M — minus (S = 1)	111

JMP addr (Jump)
(PC) — (byte 3) (byte 2)

Control is transferred to the instruction whose address is specified in byte 3 and byte 2 of the current instruction.

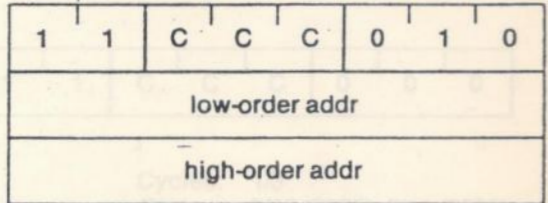


Cycles: 3
States: 10
Addressing: immediate
Flags: none

Jcondition addr (Conditional jump)

If (CCC),
(PC) — (byte 3) (byte 2)

If the specified condition is true, control is transferred to the instruction whose address is specified in byte 3 and byte 2 of the current instruction; otherwise, control continues sequentially.



Cycles: 2/3 (8085), 3 (8080)
States: 7/10 (8085), 10 (8080)
Addressing: immediate
Flags: none

CALL addr (Call)

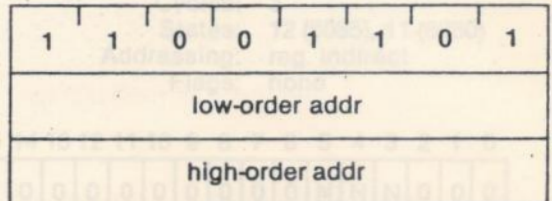
((SP) - 1) — (PCH)

((SP) - 2) — (PCL)

(SP) — (SP) - 2

(PC) — (byte 3) (byte 2)

The high-order eight bits of the next instruction address are moved to the memory location whose address is one less than the content of register SP. The low-order eight bits of the next instruction address are moved to the memory location whose address is two less than the content of register SP. The content of register SP is decremented by 2. Control is transferred to the instruction whose address is specified in byte 3 and byte 2 of the current instruction.

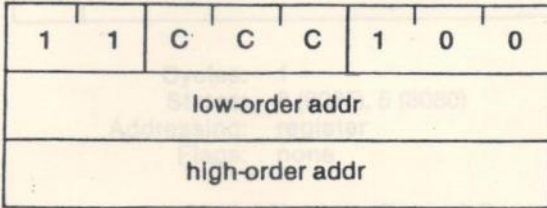


Cycles: 5
States: 18 (8085), 17 (8080)
Addressing: immediate/
reg. indirect
Flags: none

THE INSTRUCTION SET

Ccondition addr (Condition call)

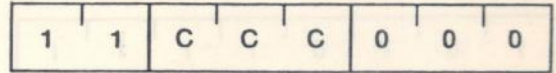
If (CCC),
 $((SP) - 1) - (PCH)$
 $((SP) - 2) - (PCL)$
 $(SP) - (SP) - 2$
 $(PC) - (\text{byte } 3) (\text{byte } 2)$
 If the specified condition is true, the actions specified in the CALL instruction (see above) are performed; otherwise, control continues sequentially.



Cycles: 2/5 (8085), 3/5 (8080)
 States: 9/18 (8085), 11/17 (8080)
 Addressing: immediate/
 reg. indirect
 Flags: none

Rcondition (Conditional return)

If (CCC),
 $(PCL) - ((SP))$
 $(PCH) - ((SP) + 1)$
 $(SP) - (SP) + 2$
 If the specified condition is true, the actions specified in the RET instruction (see above) are performed; otherwise, control continues sequentially.

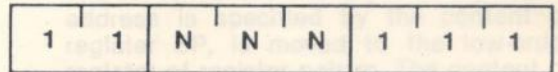


Cycles: 1/3
 States: 6/12 (8085), 5/11 (8080)
 Addressing: reg. indirect
 Flags: none

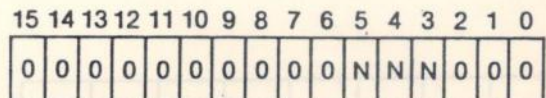
RST n (Restart)

$((SP) - 1) - (PCH)$
 $((SP) - 2) - (PCL)$
 $(SP) - (SP) - 2$
 $(PC) - 8 * (NNN)$

The high-order eight bits of the next instruction address are moved to the memory location whose address is one less than the content of register SP. The low-order eight bits of the next instruction address are moved to the memory location whose address is two less than the content of register SP. The content of register SP is decremented by two. Control is transferred to the instruction whose address is eight times the content of NNN.



Cycles: 3
 States: 12 (8085), 11 (8080)
 Addressing: reg. indirect
 Flags: none

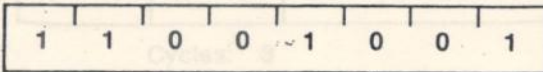


Program Counter After Restart

Cycles: 3
 States: 10
 Addressing: reg. indirect
 Flags: none

RET (Return)

$(PCL) - ((SP));$
 $(PCH) - ((SP) + 1);$
 $(SP) - (SP) + 2;$
 The content of the memory location whose address is specified in register SP is moved to the low-order eight bits of register PC. The content of the memory location whose address is one more than the content of register SP is moved to the high-order eight bits of register PC. The content of register SP is incremented by 2.

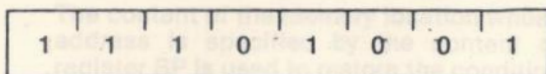


THE INSTRUCTION SET

PCHL (Jump H and L indirect — move H and L to PC)

(PCH) — (H)
(PCL) — (L)

The content of register H is moved to the high-order eight bits of register PC. The content of register L is moved to the low-order eight bits of register PC.



Cycles: 1
States: 6 (8085), 5 (8080)
Addressing: register
Flags: none

5.6.5 Stack, I/O, and Machine Control Group

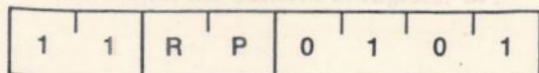
This group of instructions performs I/O, manipulates the Stack, and alters internal control flags.

Unless otherwise specified, **condition flags are not affected by any instructions in this group.**

PUSH rp (Push)

$((SP) - 1) - (rh)$
 $((SP) - 2) - (rl)$
 $((SP) - (SP) - 2$

The content of the high-order register of register pair *rp* is moved to the memory location whose address is one less than the content of register SP. The content of the low-order register of register pair *rp* is moved to the memory location whose address is two less than the content of register SP. The content of register SP is decremented by 2. **Note: Register pair *rp* = SP may not be specified.**

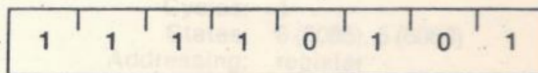


Cycles: 3
States: 12 (8085), 11 (8080)
Addressing: reg. indirect
Flags: none

PUSH PSW (Push processor status word)

$((SP) - 1) - (A)$
 $((SP) - 2)_0 - (CY), ((SP) - 2)_1 - X$
 $((SP) - 2)_2 - (P), ((SP) - 2)_3 - X$
 $((SP) - 2)_4 - (AC), ((SP) - 2)_5 - X$
 $((SP) - 2)_6 - (Z), ((SP) - 2)_7 - (S)$
 $((SP) - (SP) - 2$ X: Undefined.

The content of register A is moved to the memory location whose address is one less than register SP. The contents of the condition flags are assembled into a processor status word and the word is moved to the memory location whose address is two less than the content of register SP. The content of register SP is decremented by two.



Cycles: 3
States: 12 (8085), 11 (8080)
Addressing: reg. indirect
Flags: none

FLAG WORD

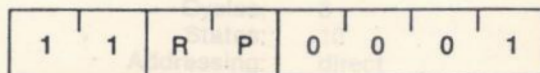
D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀
S	Z	X	AC	X	P	X	CY

X: undefined

POP rp (Pop)

$(rl) - ((SP))$
 $(rh) - ((SP) + 1)$
 $(SP) - (SP) + 2$

The content of the memory location, whose address is specified by the content of register SP, is moved to the low-order register of register pair *rp*. The content of the memory location, whose address is one more than the content of register SP, is moved to the high-order register of register pair *rp*. The content of register SP is incremented by 2. **Note: Register pair *rp* = SP may not be specified.**



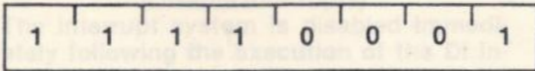
Cycles: 3
States: 10
Addressing: reg. indirect
Flags: none

THE INSTRUCTION SET

POP PSW (Pop processor status word)

$(CY) - ((SP))_0$
 $(P) - ((SP))_2$
 $(AC) - ((SP))_4$
 $(Z) - ((SP))_6$
 $(S) - ((SP))_7$
 $(A) - ((SP) + 1)$
 $(SP) - (SP) + 2$

The content of the memory location whose address is specified by the content of register SP is used to restore the condition flags. The content of the memory location whose address is one more than the content of register SP is moved to register A. The content of register SP is incremented by 2.

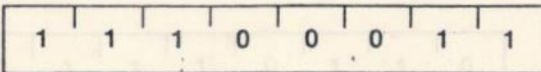


Cycles: 3
 States: 10
 Addressing: reg. indirect
 Flags: Z,S,P,CY,AC

XTHL (Exchange stack top with H and L)

$(L) - ((SP))$
 $(H) - ((SP) + 1)$

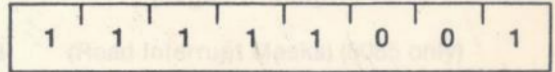
The content of the L register is exchanged with the content of the memory location whose address is specified by the content of register SP. The content of the H register is exchanged with the content of the memory location whose address is one more than the content of register SP.



Cycles: 5
 States: 16 (8085), 18 (8080)
 Addressing: reg. indirect
 Flags: none

SPHL (Move HL to SP)

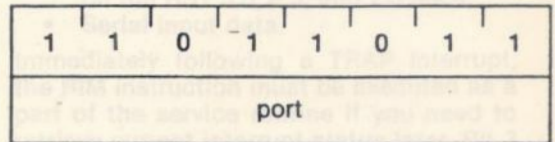
$(SP) - (H) (L)$
 The contents of registers H and L (16 bits) are moved to register SP.



Cycles: 1
 States: 6 (8085), 5 (8080)
 Addressing: register
 Flags: none

IN port (Input)

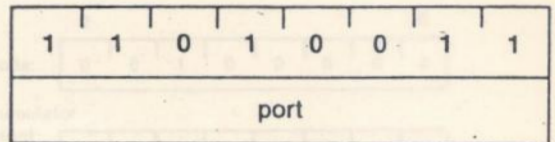
$(A) - (\text{data})$
 The data placed on the eight bit bi-directional data bus by the specified port is moved to register A.



Cycles: 3
 States: 10
 Addressing: direct
 Flags: none

OUT port (Output)

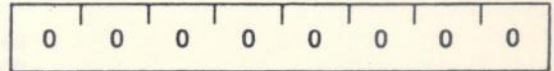
$(\text{data}) - (A)$
 The content of register A is placed on the eight bit bi-directional data bus for transmission to the specified port.



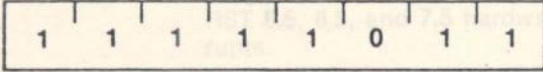
Cycles: 3
 States: 10
 Addressing: direct
 Flags: none

THE INSTRUCTION SET

EI (Enable interrupts)
 The interrupt system is enabled following the execution of the next instruction. Interrupts are not recognized during the EI instruction.



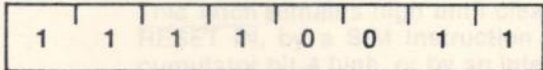
Cycles: 1
 States: 4
 Flags: none



Cycles: 1
 States: 4
 Flags: none

NOTE: Placing an EI instruction on the bus in response to \overline{INTA} during an \overline{INA} cycle is prohibited. (8085)

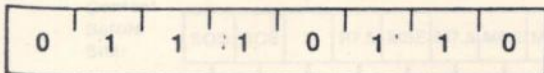
DI (Disable interrupts)
 The interrupt system is disabled immediately following the execution of the DI instruction. Interrupts are not recognized during the DI instruction.



Cycles: 1
 States: 4
 Flags: none

NOTE: Placing a DI instruction on the bus in response to \overline{INTA} during an \overline{INA} cycle is prohibited. (8085)

HLT (Halt)
 The processor is stopped. The registers and flags are unaffected. (8080) A second ALE is generated during the execution of HLT to strobe out the Halt cycle status information. (8085)



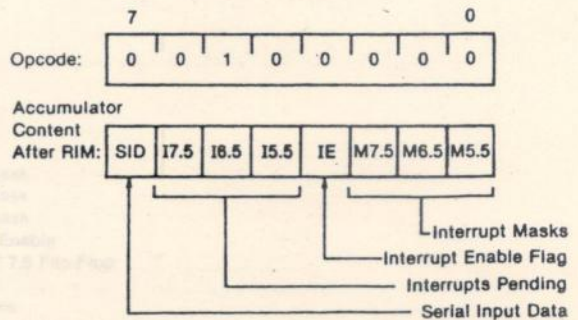
Cycles: 1+ (8085), 1 (8080)
 States: 5 (8085), 7 (8080)
 Flags: none

NOP (No op)
 No operation is performed. The registers and flags are unaffected.

RIM (Read Interrupt Masks) (8085 only)
 The RIM instruction loads data into the accumulator relating to interrupts and the serial input. This data contains the following information:

- Current interrupt mask status for the RST 5.5, 6.5, and 7.5 hardware interrupts (1 = mask disabled)
- Current interrupt enable flag status (1 = interrupts enabled) except immediately following a TRAP interrupt. (See below.)
- Hardware interrupts pending (i.e., signal received but not yet serviced), on the RST 5.5, 6.5, and 7.5 lines.
- Serial input data.

Immediately following a TRAP interrupt, the RIM instruction must be executed as a part of the service routine if you need to retrieve current interrupt status later. Bit 3 of the accumulator is (in this special case only) loaded with the interrupt enable (IE) flag status that existed prior to the TRAP interrupt. Following an RST 5.5, 6.5, 7.5, or INTR interrupt, the interrupt flag flip-flop reflects the current interrupt enable status. Bit 6 of the accumulator (I7.5) is loaded with the status of the RST 7.5 flip-flop, which is always set (edge-triggered) by an input on the RST 7.5 input line, even when that interrupt has been previously masked. (See SIM Instruction.)



Cycles: 1
 States: 4
 Flags: none

8080A/8085A INSTRUCTION SET INDEX

Table 5-1

Instruction	Code	Bytes	T States		Machine Cycles
			8085A	8080A	
ACI DATA	CE data	2	7	7	F R
ADC REG	1000 1SSS	1	4	4	F
ADC M	8E	1	7	7	F R
ADD REG	1000 0SSS	1	4	4	F
ADD M	86	1	7	7	F R
ADI DATA	C6 data	2	7	7	F R
ANA REG	1010 0SSS	1	4	4	F
ANA M	A6	1	7	7	F R
ANI DATA	E6 data	2	7	7	F R
CALL LABEL	CD addr	3	18	17	S R R W W*
CC LABEL	DC addr	3	9/18	11/17	S R =/S R R W W*
CM LABEL	FC addr	3	9/18	11/17	S R =/S R R W W*
CMA	2F	1	4	4	F
CMC	3F	1	4	4	F
CMP REG	1011 1SSS	1	4	4	F
CMP M	BE	1	7	7	F R
CNC LABEL	D4 addr	3	9/18	11/17	S R =/S R R W W*
CNZ LABEL	C4 addr	3	9/18	11/17	S R =/S R R W W*
CP LABEL	F4 addr	3	9/18	11/17	S R =/S R R W W*
CPE LABEL	EC addr	3	9/18	11/17	S R =/S R R W W*
CPI DATA	FE data	2	7	7	F R
CPO LABEL	E4 addr	3	9/18	11/17	S R =/S R R W W*
CZ LABEL	CC addr	3	9/18	11/17	S R =/S R R W W*
DAA	27	1	4	4	F
DAD RP	00RP 1001	1	10	10	F B B
DCR REG	00SS S101	1	4	5	F*
DCR M	35	1	10	10	F R W
DCX RP	00RP 1011	1	6	5	S*
DI	F3	1	4	4	F
EI	FB	1	4	4	F
HLT	76	1	5	7	F B
IN PORT	DB data	2	10	10	F R I
INR REG	00SS S100	1	4	5	F*
INR M	34	1	10	10	F R W
INX RP	00RP 0011	1	6	5	S*
JC LABEL	DA addr	3	7/10	10	F R/F R R†
JM LABEL	FA addr	3	7/10	10	F R/F R R†
JMP LABEL	C3 addr	3	10	10	F R R
JNC LABEL	D2 addr	3	7/10	10	F R/F R R†
JNZ LABEL	C2 addr	3	7/10	10	F R/F R R†
JP LABEL	F2 addr	3	7/10	10	F R/F R R†
JPE LABEL	EA addr	3	7/10	10	F R/F R R†
JPO LABEL	E2 addr	3	7/10	10	F R/F R R†
JZ LABEL	CA addr	3	7/10	10	F R/F R R†
LDA ADDR	3A addr	3	13	13	F R R R
LDAX RP	000X 1010	1	7	7	F R
LHLD ADDR	2A addr	3	16	16	F R R R R

Instruction	Code	Bytes	T States		Machine Cycles
			8085A	8080A	
LXI RP,DATA16	00RP 0001 data16	3	10	10	F R R
MOV REG,REG	01DD 0SSS	1	4	5	F*
MOV M,REG	0111 0SSS	1	7	7	F W
MOV REG,M	01DD D110	1	7	7	F R
MVI REG,DATA	00DD D110 data	2	7	7	F R
MVI M,DATA	36 data	2	10	10	F R W
NOP	00	1	4	4	F
ORA REG	1011 0SSS	1	4	4	F
ORA M	B6	1	7	7	F R
ORI DATA	D3 data	2	7	7	F R
OUT PORT	D3 data	2	10	10	F R O
PCHL	E9	1	6	5	S*
POP -RP	11RP 0001	1	-10	10	F R R
PUSH RP	11RP 0101	1	12	11	SW W*
RAL	17	1	4	4	F
RAR	1F	1	4	4	F
RC	D8	1	6/12	5/11	S/S R R*
RET	C9	1	10	10	F R R
RIM (8085A only)	20	1	4	-	F
RLC	07	1	4	4	F
RM	F8	1	6/12	5/11	S/S R R*
RNC	D0	1	6/12	5/11	S/S R R*
RNZ	C0	1	6/12	5/11	S/S R R*
RP	F0	1	6/12	5/11	S/S R R*
RPE	E8	1	6/12	5/11	S/S R R*
RPO	E0	1	6/12	5/11	S/S R R*
RRC	0F	1	4	4	F
RST N	11XX X111	1	12	11	SW W*
RZ	C8	1	6/12	5/11	S/S R R*
SBB REG	1001 1SSS	1	4	4	F
SBB M	9E	1	7	7	F R
SBI DATA	DE data	2	7	7	F R
SHLD ADDR	22 addr	3	16	16	F R R W W
SIM (8085A only)	30	1	4	-	F
SPHL	F9	1	6	5	S*
STA ADDR	32 addr	3	13	13	F R R W
STAX RP	000X 0010	1	7	7	F W
STC	37	1	4	4	F
SUB REG	1001 0SSS	1	4	4	F
SUB M	96	1	7	7	F R
SUI DATA	D6 data	2	7	7	F R
XCHG	EB	1	4	4	F
XRA REG	1010 1SSS	1	4	4	F
XRA M	AE	1	7	7	F R
XRI DATA	EE data	2	7	7	F R
XTHL	E3	1	16	18	F R R W W

Machine cycle types:

F	Four clock period instr fetch
S	Six clock period instr fetch
R	Memory read
I	I/O read
W	Memory write
O	I/O write
B	Bus idle
X	Variable or optional binary digit
DDD	Binary digits identifying a destination register B = 000, C = 001, D = 010 Memory = 110
SSS	Binary digits identifying a source register E = 011, H = 100, L = 101 A = 111
RP	Register Pair BC = 00, HL = 10 DE = 01, SP = 11

*Five clock period instruction fetch with 8080A.

†The longer machine cycle sequence applies regardless of condition evaluation with 8080A.

*An extra READ cycle (R) will occur for this condition with 8080A.

8085A CPU INSTRUCTIONS IN OPERATION CODE SEQUENCE

Table 5-2

OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC
00	NOP	2B	DCX H	56	MOV D,M	81	ADD C	AC	XRA H	D7	RST 2		
01	LXI B,D16	2C	INR L	57	MOV D,A	82	ADD D	AD	XRA L	D8	RC		
02	STAX B	2D	DCR L	58	MOV E,B	83	ADD E	AE	XRA M	D9	-		
03	INX B	2E	MVI L,DB	59	MOV E,C	84	ADD H	AF	XRA A	DA	JC Adr		
04	INR B	2F	CMA	5A	MOV E,D	85	ADD L	B0	ORA B	DB	IN DB		
05	DCR B	30	SIM	5B	MOV E,E	86	ADD M	B1	ORA C	DC	CC Adr		
06	MVI B,DB	31	LXI SP,D16	5C	MOV E,H	87	ADD A	B2	ORA D	DD	-		
07	RLC	32	STA Adr	5D	MOV E,L	88	ADC B	B3	ORA E	DE	SBI DB		
08	-	33	INX SP	5E	MOV E,M	89	ADC C	B4	ORA H	DF	RST 3		
09	DAD B	34	INR M	5F	MOV E,A	8A	ADC D	B5	ORA L	E0	RPO		
0A	LDAX B	35	DCR M	60	MOV H,B	8B	ADC E	B6	ORA M	E1	POP H		
0B	DCX B	36	MVI M,DB	61	MOV H,C	8C	ADC H	B7	ORA A	E2	JPO Adr		
0C	INR C	37	STC	62	MOV H,D	8D	ADC L	B8	CMP B	E3	XTHL		
0D	DCR C	38	-	63	MOV H,E	8E	ADC M	B9	CMP C	E4	CPO Adr		
0E	MVI C,DB	39	DAD SP	64	MOV H,H	8F	ADC A	BA	CMP D	E5	PUSH H		
0F	RRC	3A	LDA Adr	65	MOV H,L	90	SUB B	BB	CMP E	E6	ANI DB		
10	-	3B	DCX SP	66	MOV H,M	91	SUB C	BC	CMP H	E7	RST 4		
11	LXI D,D16	3C	INR A	67	MOV H,A	92	SUB D	BD	CMP L	E8	RPE		
12	STAX D	3D	DCR A	68	MOV L,B	93	SUB E	BE	CMP M	E9	PCHL		
13	INX D	3E	MVI A,DB	69	MOV L,C	94	SUB H	BF	CMP A	EA	JPE Adr		
14	INR D	3F	CMC	6A	MOV L,D	95	SUB L	C0	RNZ	EB	XCHG		
15	DCR D	40	MOV B,B	6B	MOV L,E	96	SUB M	C1	POP B	EC	CPE Adr		
16	MVI D,DB	41	MOV B,C	6C	MOV L,H	97	SUB A	C2	JNZ Adr	ED	-		
17	RAL	42	MOV B,D	6D	MOV L,L	98	SBB B	C3	JMP Adr	EE	XRI DB		
18	-	43	MOV B,E	6E	MOV L,M	99	SBB C	C4	CNZ Adr	EF	RST 5		
19	DAD D	44	MOV B,H	6F	MOV L,A	9A	SBB D	C5	PUSH B	F0	RP		
1A	LDAX D	45	MOV B,L	70	MOV M,B	9B	SBB E	C6	ADI DB	F1	POP PSW		
1B	DCX D	46	MOV B,M	71	MOV M,C	9C	SBB H	C7	RST 0	F2	JP Adr		
1C	INR E	47	MOV B,A	72	MOV M,D	9D	SBB L	C8	RZ	F3	DI		
1D	DCR E	48	MOV C,B	73	MOV M,E	9E	SBB M	C9	RET Adr	F4	CP Adr		
1E	MVI E,DB	49	MOV C,C	74	MOV M,H	9F	SBB A	CA	JZ	F5	PUSH PSW		
1F	RAR	4A	MOV C,D	75	MOV M,L	A0	ANA B	CB	-	F6	ORI DB		
20	RIM	4B	MOV C,E	76	HLT	A1	ANA C	CC	CZ Adr	F7	RST 6		
21	LXI H,D16	4C	MOV C,H	77	MOV M,A	A2	ANA D	CD	CALL Adr	F8	RM		
22	SHLD Adr	4D	MOV C,L	78	MOV A,B	A3	ANA E	CE	ACI DB	F9	SPHL		
23	INX H	4E	MOV C,M	79	MOV A,C	A4	ANA H	CF	RST 1	FA	JM Adr		
24	INR H	4F	MOV C,A	7A	MOV A,D	A5	ANA L	D0	RNC	FB	EI		
25	DCR H	50	MOV D,B	7B	MOV A,E	A6	ANA M	D1	POP D	FC	CM Adr		
26	MVI H,DB	51	MOV D,C	7C	MOV A,H	A7	ANA A	D2	JNC Adr	FD	-		
27	DAA	52	MOV D,D	7D	MOV A,L	A8	XRA B	D3	OUT DB	FE	CPI DB		
28	-	53	MOV D,E	7E	MOV A,M	A9	XRA C	D4	CNC Adr	FF	RST 7		
29	DAD H	54	MOV D,H	7F	MOV A,A	AA	XRA D	D5	PUSH D				
2A	LHLD Adr	55	MOV D,L	80	ADD B	AB	XRA E	D6	SUI DB				

DB = constant, or logical/arithmetic expression that evaluates to an 8-bit data quantity.

Adr = 16-bit address.

D16 = constant, or logical/arithmetic expression that evaluates to a 16-bit data quantity.

8085A INSTRUCTION SET SUMMARY BY FUNCTIONAL GROUPING

Table 5-3

Mnemonic	Description	Instruction Code (1)								Page	Mnemonic	Description	Instruction Code (1)								Page
		D7	D6	D5	D4	D3	D2	D1	D0				D7	D6	D5	D4	D3	D2	D1	D0	
MOVE, LOAD, AND STORE																					
MOV r,r2	Move register to register	0	1	0	0	0	0	0	0	5-4	CZ	Call on zero	1	1	0	0	1	1	0	0	5-14
MOV M,r	Move register to memory	0	1	1	1	0	0	0	0	5-4	CNZ	Call on no zero	1	1	0	0	0	1	0	0	5-14
MOV r,M	Move memory to register	0	1	0	0	0	1	1	0	5-4	CP	Call on positive	1	1	1	1	0	1	0	0	5-14
MVI r	Move immediate register	0	0	0	0	0	1	1	0	5-4	CM	Call on minus	1	1	1	1	1	1	0	0	5-14
MVI M	Move immediate memory	0	0	1	1	0	1	1	0	5-4	CPE	Call on parity even	1	1	1	0	1	1	0	0	5-14
LXI B	Load immediate register Pair B & C	0	0	0	0	0	0	0	1	5-5	CPO	Call on parity odd	1	1	1	0	0	1	0	0	5-14
LXI D	Load immediate register Pair D & E	0	0	0	1	0	0	0	1	5-5	RETURN										
LXI H	Load immediate register Pair H & L	0	0	1	0	0	0	0	1	5-5	RET	Return	1	1	0	0	1	0	0	1	5-14
STAX B	Store A indirect	0	0	0	0	0	0	1	0	5-6	RC	Return on carry	1	1	0	1	1	0	0	0	5-14
STAX D	Store A indirect	0	0	0	1	0	0	1	0	5-6	RNC	Return on no carry	1	1	0	1	0	0	0	0	5-14
LDAX B	Load A indirect	0	0	0	0	1	0	1	0	5-5	RZ	Return on zero	1	1	0	0	1	0	0	0	5-14
LDAX D	Load A indirect	0	0	0	1	1	0	1	0	5-5	RNZ	Return on no zero	1	1	0	0	0	0	0	0	5-14
STA	Store A direct	0	0	1	1	0	0	1	0	5-5	RP	Return on positive	1	1	1	1	0	0	0	0	5-14
LDA	Load A direct	0	0	1	1	1	0	1	0	5-5	RM	Return on minus	1	1	1	1	1	0	0	0	5-14
SHLD	Store H & L direct	0	0	1	0	0	0	1	0	5-5	RPE	Return on parity even	1	1	1	0	1	0	0	0	5-14
LHLD	Load H & L direct	0	0	1	0	1	0	1	0	5-5	RPO	Return on parity odd	1	1	1	0	0	0	0	0	5-14
XCHG	Exchange D & E, H & L Registers	1	1	1	0	1	0	1	1	5-6	RESTART										
STACK OPS																					
PUSH B	Push register Pair B & C on stack	1	1	0	0	0	1	0	1	5-15	RST	Restart	1	1	A	A	A	1	1	1	5-14
PUSH D	Push register Pair D & E on stack	1	1	0	1	0	1	0	1	5-15	INPUT/OUTPUT										
PUSH H	Push register Pair H & L on stack	1	1	1	0	0	1	0	1	5-15	IN	Input	1	1	0	1	1	0	1	1	5-16
PUSH PSW	Push A and Flags on stack	1	1	1	1	0	1	0	1	5-15	OUT	Output	1	1	0	1	0	0	1	1	5-16
POP B	Pop register Pair B & C off stack	1	1	0	0	0	0	0	1	5-15	INCREMENT AND DECREMENT										
POP D	Pop register Pair D & E off stack	1	1	0	1	0	0	0	1	5-15	INR r	Increment register	0	0	0	0	0	1	0	0	5-8
POP H	Pop register Pair H & L off stack	1	1	1	0	0	0	0	1	5-15	DCR r	Decrement register	0	0	0	0	0	1	0	1	5-8
POP PSW	Pop A and Flags off stack	1	1	1	1	0	0	0	1	5-15	INR M	Increment memory	0	0	1	1	0	1	0	0	5-8
XTHL	Exchange top of stack, H & L	1	1	1	0	0	0	1	1	5-16	DCR M	Decrement memory	0	0	1	1	0	1	0	1	5-8
SPHL	H & L to stack pointer	1	1	1	1	1	0	0	1	5-16	INX B	Increment B & C registers	0	0	0	0	0	0	1	1	5-9
LXI SP	Load immediate stack pointer	0	0	1	1	0	0	0	1	5-5	INX D	Increment D & E registers	0	0	0	1	0	0	1	1	5-9
INX SP	Increment stack pointer	0	0	1	1	0	0	1	1	5-9	INX H	Increment H & L registers	0	0	1	0	0	0	1	1	5-9
DCX SP	Decrement stack pointer	0	0	1	1	1	0	1	1	5-9	DCX B	Decrement B & C	0	0	0	0	1	0	1	1	5-9
JUMP																					
JMP	Jump unconditional	1	1	0	0	0	0	1	1	5-13	DCX D	Decrement D & E	0	0	0	1	1	0	1	1	5-9
JC	Jump on carry	1	1	0	1	1	0	1	0	5-13	DCX H	Decrement H & L	0	0	1	0	1	0	1	1	5-9
JNC	Jump on no carry	1	1	0	1	0	0	1	0	5-13	DCX SP	Decrement H & L	0	0	1	0	1	0	1	1	5-9
JZ	Jump on zero	1	1	0	0	1	0	1	0	5-13	ADD										
JNZ	Jump on no zero	1	1	0	0	0	0	1	0	5-13	ADD r	Add register to A	1	0	0	0	0	0	0	0	5-6
JP	Jump on positive	1	1	1	1	0	0	1	0	5-13	ADC r	Add register to A with carry	1	0	0	0	1	0	0	0	5-6
JM	Jump on minus	1	1	1	1	1	0	1	0	5-13	ADD M	Add memory to A	1	0	0	0	0	1	1	0	5-6
JPE	Jump on parity even	1	1	1	0	1	0	1	0	5-13	ADC M	Add memory to A with carry	1	0	0	0	1	1	1	0	5-7
JPO	Jump on parity odd	1	1	1	0	0	0	1	0	5-13	ADI	Add immediate to A	1	1	0	0	0	1	1	0	5-6
PCHL	H & L to program counter	1	1	1	0	1	0	0	1	5-15	ACI	Add immediate to A with carry	1	1	0	0	1	1	1	0	5-7
CALL																					
CALL	Call unconditional	1	1	0	0	1	1	0	1	5-13	DAD B	Add B & C to H & L	0	0	0	0	1	0	0	1	5-9
CC	Call on carry	1	1	0	1	1	1	0	0	5-14	DAD D	Add D & E to H & L	0	0	0	1	1	0	0	1	5-9
CNC	Call on no carry	1	1	0	1	0	1	0	0	5-14	DAD H	Add H & L to H & L	0	0	1	0	1	0	0	1	5-9
											DAD SP	Add stack pointer to H & L	0	0	1	1	1	0	0	1	5-9
SUBTRACT																					
											SUB r	Subtract register from A	1	0	0	1	0	0	0	0	5-7
											SBB r	Subtract register from A with borrow	1	0	0	1	1	0	0	0	5-7
											SUB M	Subtract memory from A	1	0	0	1	0	1	1	0	5-7
											SBB M	Subtract memory from A with borrow	1	0	0	1	1	1	1	0	5-8
											SUI	Subtract immediate from A	1	1	0	1	0	1	1	0	5-7

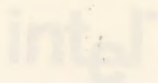
8085A INSTRUCTION SET SUMMARY (Cont'd)
Table 5-3

Mnemonic	Description	Instruction Code (1)								Page	Mnemonic	Description	Instruction Code (1)								Page											
		D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀				D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀												
SBI	Subtract immediate from A with borrow	1	1	0	1	1	1	1	0	5-8	RRC	Rotate A right	0	0	0	0	1	1	1	1	5-12	RAL	Rotate A left through carry	0	0	0	1	0	1	1	1	5-12
LOGICAL																																
ANA r	And register with A	1	0	1	0	0	S	S	S	5-9	RAR	Rotate A right through carry	0	0	0	1	1	1	1	1	5-12	SPECIALS										
XRA r	Exclusive OR register with A	1	0	1	0	1	S	S	S	5-10	CMA	Complement A	0	0	1	0	1	1	1	1	5-12	STC	Set carry	0	0	1	1	0	1	1	1	5-12
ORA r	OR register with A	1	0	1	1	0	S	S	S	5-10	CMC	Complement carry	0	0	1	1	1	1	1	1	5-12	DAA	Decimal adjust A	0	0	1	0	0	1	1	1	5-9
CMP r	Compare register with A	1	0	1	1	1	S	S	S	5-11	CONTROL																					
ANA M	And memory with A	1	0	1	0	0	1	1	0	5-10	EI	Enable Interrupts	1	1	1	1	1	0	1	1	5-17	DI	Disable Interrupt	1	1	1	1	0	0	1	1	5-17
XRA M	Exclusive OR memory with A	1	0	1	0	1	1	1	0	5-10	NOP	No-operation	0	0	0	0	0	0	0	0	5-17	HLT	Halt	0	1	1	1	0	1	1	0	5-17
ORA M	OR memory with A	1	0	1	1	0	1	1	0	5-11	NEW 8085A INSTRUCTIONS																					
CMP M	Compare memory with A	1	0	1	1	1	1	1	0	5-11	RIM	Read Interrupt Mask	0	0	1	0	0	0	0	0	5-17	SIM	Set Interrupt Mask	0	0	1	1	0	0	0	0	5-18
ANI	And immediate with A	1	1	1	0	0	1	1	0	5-10																						
XRI	Exclusive OR immediate with A	1	1	1	0	1	1	1	0	5-10																						
ORI	OR immediate with A	1	1	1	1	0	1	1	0	5-11																						
CPI	Compare immediate with A	1	1	1	1	1	1	1	0	5-11																						
ROTATE																																
RLC	Rotate A left	0	0	0	0	0	1	1	1	5-11																						

NOTES: 1. DDS or SSS: B 000, C 001, D 010, E011, H 100, L 101, Memory 110, A 111.

2. Two possible cycle times. (6/12) indicate instruction cycles dependent on condition flags.

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8085A, 8085A-2 SINGLE CHIP 8-BIT N-CANNEL MICROPROCESSORS

- Single +5V Power Supply
- 100% Software Compatible with 8080A
- 1.2 μ s Instruction Cycle (8085A)
0.8 μ s (8085A-2)
- On-Chip Clock Generator (with External Crystal, LC or RC Network)
- On-Chip System Controller, Advanced Cycle Status Information Available for Large System Control
- Four Vectored Interrupt Levels (One is non-Maskable Plus an 8085A-compatible Interrupt)
- Serial In-Serial Out Port
- Decimal, Binary and Double Precision Arithmetic
- Direct Addressing Capability to 64K Bytes of Memory

The 8085A and 8085A-2 provide a complete 8-bit microprocessor system on a single chip. They are designed to be used in a wide variety of applications, from simple control systems to complex data processing systems. The 8085A-2 is a high-speed version of the 8085A, offering a high level of performance.

The 8085A and 8085A-2 are available in a variety of packages, including DIP, PLCC, and Quad Flat Pack. They are also available in a surface-mount package, the 8085A-2S, which offers a high level of performance and a small footprint.

ANEXO II

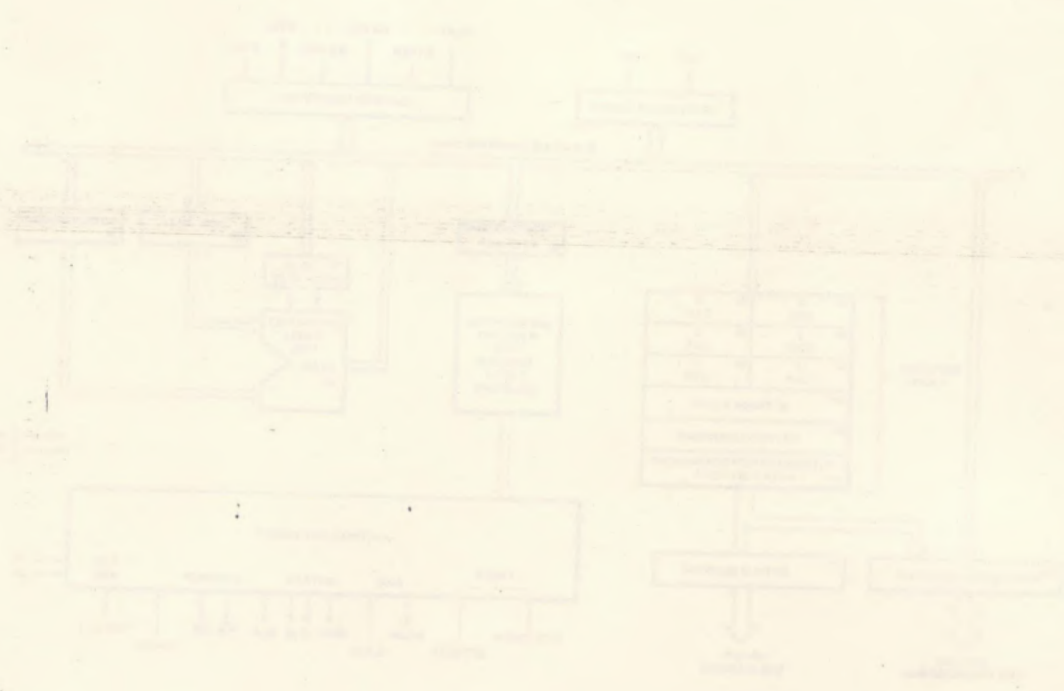


Figure 1. 8085A 8085 Functional Block Diagram



8085A/8085A-2 SINGLE CHIP 8-BIT N-CHANNEL MICROPROCESSORS

- Single +5V Power Supply
- 100% Software Compatible with 8080A
- 1.3 μ s Instruction Cycle (8085A);
0.8 μ s (8085A-2)
- On-Chip Clock Generator (with External
Crystal, LC or RC Network)
- On-Chip System Controller; Advanced
Cycle Status Information Available for
Large System Control
- Four Vectored Interrupt Inputs (One is
non-Maskable) Plus an 8080A-
compatible interrupt
- Serial In/Serial Out Port
- Decimal, Binary and Double Precision
Arithmetic
- Direct Addressing Capability to 64k
Bytes of Memory

The Intel® 8085A is a complete 8 bit parallel Central Processing Unit (CPU). Its instruction set is 100% software compatible with the 8080A microprocessor, and it is designed to improve the present 8080A's performance by higher system speed. Its high level of system integration allows a minimum system of three IC's [8085A (CPU), 8156 (RAM/IO) and 8355/8755A (ROM/PROM/IO)] while maintaining total system expandability. The 8085A-2 is a faster version of the 8085A.

The 8085A incorporates all of the features that the 8224 (clock generator) and 8228 (system controller) provided for the 8080A, thereby offering a high level of system integration.

The 8085A uses a multiplexed data bus. The address is split between the 8 bit address bus and the 8 bit data bus. The on-chip address latches of 8155/8156/8355/8755A memory products allow a direct interface with the 8085A.

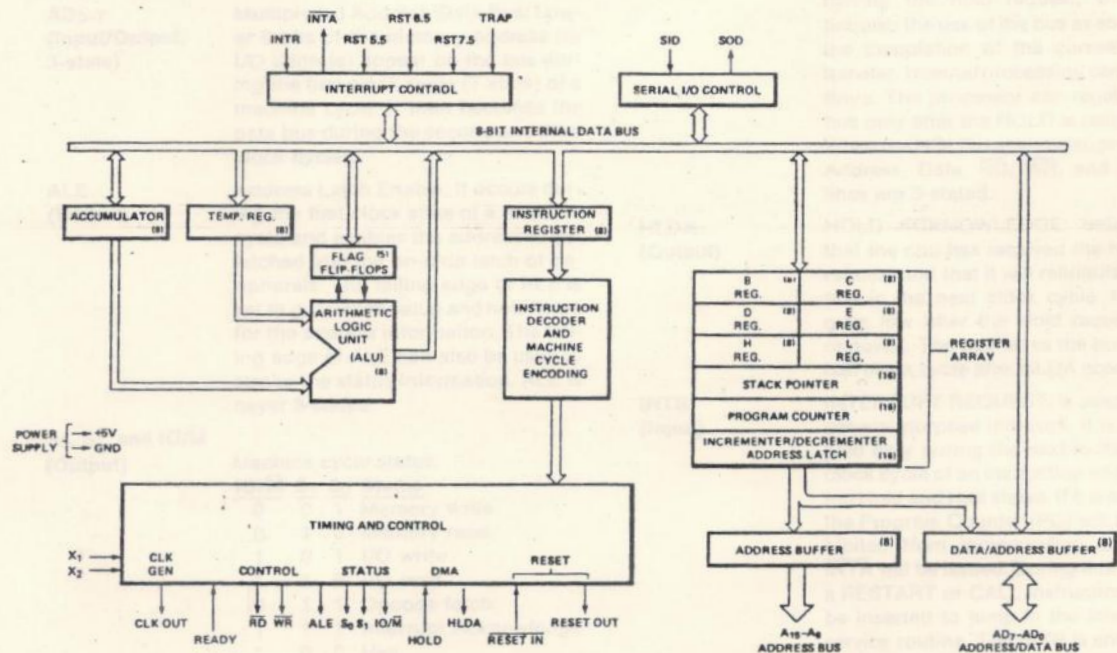


Figure 1. 8085A CPU Functional Block Diagram

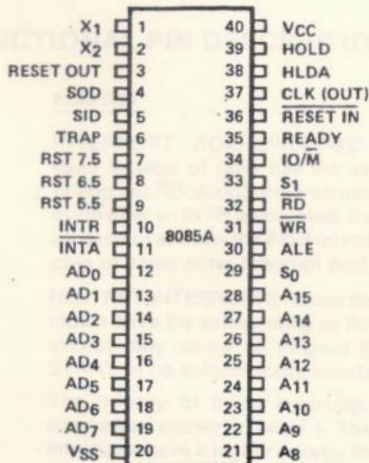


Figure 2. 8085A Pinout Diagram

8085A FUNCTIONAL PIN DEFINITION

The following describes the function of each pin:

Symbol	Function
A₈-A₁₅ (Output, 3-state)	Address Bus: The most significant 8 bits of the memory address or the 8 bits of the I/O address, 3-stated during Hold and Halt modes and during RESET.
AD₀₋₇ (Input/Output, 3-state)	Multiplexed Address/Data Bus: Lower 8 bits of the memory address (or I/O address) appear on the bus during the first clock cycle (T state) of a machine cycle. It then becomes the data bus during the second and third clock cycles.
ALE (Output)	Address Latch Enable: It occurs during the first clock state of a machine cycle and enables the address to get latched into the on-chip latch of peripherals. The falling edge of ALE is set to guarantee setup and hold times for the address information. The falling edge of ALE can also be used to strobe the status information. ALE is never 3-stated.

S₀, S₁, and IO/M
(Output)

Machine cycle status:

IO/M	S ₁	S ₀	Status
0	0	1	Memory write
0	1	0	Memory read
1	0	1	I/O write
1	1	0	I/O read
0	1	1	Opcode fetch
1	1	1	Interrupt Acknowledge
*	0	0	Halt
*	X	X	Hold
*	X	X	Reset

* = 3-state (high impedance)

X = unspecified

Symbol

Function

S₁ can be used as an advanced R/W status. IO/M, S₀ and S₁ become valid at the beginning of a machine cycle and remain stable throughout the cycle. The falling edge of ALE may be used to latch the state of these lines.

RD
(Output, 3-state)

READ control: A low level on \overline{RD} indicates the selected memory or I/O device is to be read and that the Data Bus is available for the data transfer, 3-stated during Hold and Halt modes and during RESET.

WR
(Output, 3-state)

WRITE control: A low level on \overline{WR} indicates the data on the Data Bus is to be written into the selected memory or I/O location. Data is set up at the trailing edge of \overline{WR} . 3-stated during Hold and Halt modes and during RESET.

READY
(Input)

If READY is high during a read or write cycle, it indicates that the memory or peripheral is ready to send or receive data. If READY is low, the cpu will wait an integral number of clock cycles for READY to go high before completing the read or write cycle.

HOLD
(Input)

HOLD indicates that another master is requesting the use of the address and data buses. The cpu, upon receiving the hold request, will relinquish the use of the bus as soon as the completion of the current bus transfer. Internal processing can continue. The processor can regain the bus only after the HOLD is removed. When the HOLD is acknowledged, the Address, Data, \overline{RD} , \overline{WR} , and IO/M lines are 3-stated.

HLDA
(Output)

HOLD ACKNOWLEDGE: Indicates that the cpu has received the HOLD request and that it will relinquish the bus in the next clock cycle. HLDA goes low after the Hold request is removed. The cpu takes the bus one half clock cycle after HLDA goes low.

INTR
(Input)

INTERRUPT REQUEST: is used as a general purpose interrupt. It is sampled only during the next to the last clock cycle of an instruction and during Hold and Halt states. If it is active, the Program Counter (PC) will be inhibited from incrementing and an \overline{INTA} will be issued. During this cycle a RESTART or CALL instruction can be inserted to jump to the interrupt service routine. The INTR is enabled and disabled by software. It is disabled by Reset and immediately after an interrupt is accepted.

8085A FUNCTIONAL PIN DESCRIPTION (Continued)

Symbol	Function	Symbol	Function
INTA (Output)	INTERRUPT ACKNOWLEDGE: Is used instead of (and has the same timing as) \overline{RD} during the Instruction cycle after an INTR is accepted. It can be used to activate the 8259 Interrupt chip or some other interrupt port.		Schmitt-triggered input, allowing connection to an R-C network for power-on RESET delay. The cpu is held in the reset condition as long as $\overline{RESET\ IN}$ is applied.
RST 5.5 RST 6.5 RST 7.5 (Inputs)	RESTART INTERRUPTS: These three inputs have the same timing as INTR except they cause an internal RESTART to be automatically inserted. The priority of these interrupts is ordered as shown in Table 1. These interrupts have a higher priority than INTR. In addition, they may be individually masked out using the SIM instruction.	RESET OUT (Output)	Indicates cpu is being reset. Can be used as a system reset. The signal is synchronized to the processor clock and lasts an integral number of clock periods.
TRAP (Input)	Trap interrupt is a nonmaskable RESTART interrupt. It is recognized at the same time as INTR or RST 5.5-7.5. It is unaffected by any mask or Interrupt Enable. It has the highest priority of any interrupt. (See Table 1.)	X₁, X₂ (Input)	X ₁ and X ₂ are connected to a crystal, LC, or RC network to drive the internal clock generator. X ₁ can also be an external clock input from a logic gate. The input frequency is divided by 2 to give the processor's internal operating frequency.
RESET IN (Input)	Sets the Program Counter to zero and resets the Interrupt Enable and HLDA flip-flops. The data and address buses and the control lines are 3-stated during RESET and because of the asynchronous nature of RESET, the processor's internal registers and flags may be altered by RESET with unpredictable results. $\overline{RESET\ IN}$ is a	CLK (Output)	Clock Output for use as a system clock. The period of CLK is twice the X ₁ , X ₂ input period.
		SID (Input)	Serial input data line. The data on this line is loaded into accumulator bit 7 whenever a RIM instruction is executed.
		SOD (Output)	Serial output data line. The output SOD is set or reset as specified by the SIM instruction.
		V_{CC}	+5 volt supply.
		V_{SS}	Ground Reference.

TABLE 1. INTERRUPT PRIORITY, RESTART ADDRESS, AND SENSITIVITY

Name	Priority	Address Branched To (1) When Interrupt Occurs	Type Trigger
TRAP	1	24H	Rising edge AND high level until sampled.
RST 7.5	2	3CH	Rising edge (latched).
RST 6.5	3	34H	High level until sampled.
RST 5.5	4	2CH	High level until sampled.
INTR	5	See Note (2).	High level until sampled.

NOTES:

- (1) The processor pushes the PC on the stack before branching to the indicated address.
- (2) The address branched to depends on the instruction provided to the cpu when the interrupt is acknowledged.



8155/8156 PIN FUNCTIONS

8155/8156/8155-2/8156-2 2048 BIT STATIC MOS RAM WITH I/O PORTS AND TIMER

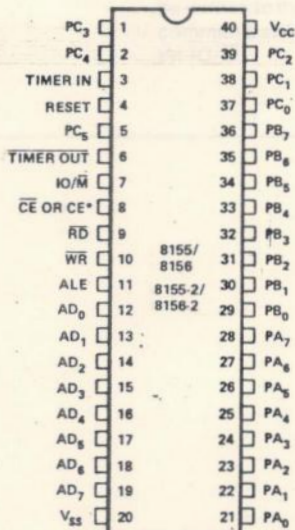
- 256 Word x 8 Bits
- Single +5V Power Supply
- Completely Static Operation
- Internal Address Latch
- 2 Programmable 8 Bit I/O Ports
- 1 Programmable 6-Bit I/O Port
- Programmable 14-Bit Binary Counter/Timer
- Compatible with 8085A and 8088 CPU
- Multiplexed Address and Data Bus
- 40 Pin DIP

The 8155 and 89156 are RAM and I/O chips to be used in the 8085A and 8088 microprocessor systems. The RAM portion is designed with 2048 static cells organized as 256 x 8. They have a maximum access time of 400 ns to permit use with no wait states in 8085A CPU. The 8155-2 and 8156-2 have maximum access times of 330 ns for use with the 8085A-2 and the full speed 5 MHz 8088 CPU.

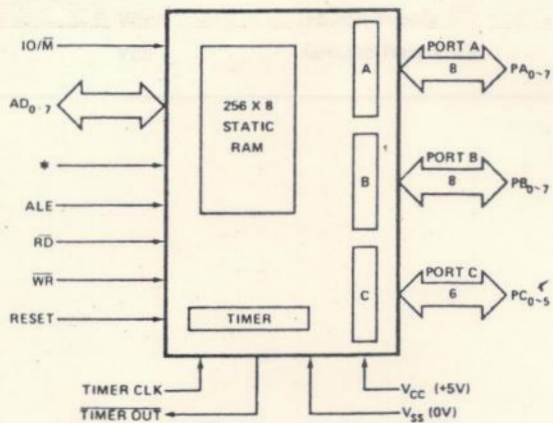
The I/O portion consists of three general purpose I/O ports. One of the three ports can be programmed to be status pins, thus allowing the other two ports to operate in handshake mode.

A 14-bit programmable counter/timer is also included on chip to provide either a square wave or terminal count pulse for the CPU system depending on timer mode.

PIN CONFIGURATION



BLOCK DIAGRAM



*: 8155/8155-2 = \overline{CE} , 8156/8156-2 = CE

8155/8156 PIN FUNCTIONS

<u>Symbol</u>	<u>Function</u>	<u>Symbol</u>	<u>Function</u>
RESET (input)	Pulse provided by the 8085A to initialize the system (connect to 8085A RESET OUT). Input high on this line resets the chip and initializes the three I/O ports to input mode. The width of RESET pulse should typically be two 8085A clock cycle times.	ALE (input)	Address Latch Enable: This control signal latches both the address on the AD ₀₋₇ lines and the state of the Chip Enable and IO/ \bar{M} into the chip at the falling edge of ALE.
AD ₀₋₇ (input)	3-state Address/Data lines that interface with the CPU lower 8-bit Address/Data Bus. The 8-bit address is latched into the address latch inside the 8155/56 on the falling edge of ALE. The address can be either for the memory section or the I/O section depending on the IO/ \bar{M} input. The 8-bit data is either written into the chip or read from the chip, depending on the \bar{WR} or \bar{RD} input signal.	IO/ \bar{M} (input)	Selects memory if low and I/O and command/status registers if high.
CE or \bar{CE} (input)	Chip Enable: On the 8155, this pin is \bar{CE} and is ACTIVE LOW. On the 8156, this pin is CE and is ACTIVE HIGH.	PA ₀₋₇ (8) (input/output)	These 8 pins are general purpose I/O pins. The in/out direction is selected by programming the command register.
\bar{RD} (input)	Read control: Input low on this line with the Chip Enable active enables and AD ₀₋₇ buffers. If IO/ \bar{M} pin is low, the RAM content will be read out to the AD bus. Otherwise the content of the selected I/O port or command/status registers will be read to the AD bus.	PB ₀₋₇ (8) (input/output)	These 8 pins are general purpose I/O pins. The in/out direction is selected by programming the command register.
\bar{WR} (input)	Write control: Input low on this line with the Chip Enable active causes the data on the Address/Data bus to be written to the RAM or I/O ports and command/status register depending on IO/ \bar{M} .	PC ₀₋₅ (6) (input/output)	These 6 pins can function as either input port, output port, or as control signals for PA and PB. Programming is done through the command register. When PC ₀₋₅ are used as control signals, they will provide the following: PC ₀ — A INTR (Port A Interrupt) PC ₁ — ABF (Port A Buffer Full) PC ₂ — \bar{A} STB (Port A Strobe) PC ₃ — B INTR (Port B Interrupt) PC ₄ — \bar{B} BF (Port B Buffer Full) PC ₅ — B STB (Port B Strobe)
		TIMER IN (input)	Input to the counter-timer.
		$\overline{\text{TIMER OUT}}$ (output)	Timer output. This output can be either a square wave or a pulse depending on the timer mode.
		V _{cc}	+5 volt supply.
		V _{ss}	Ground Reference.



PRELIMINARY
 Notice: This is not a final specification. Some parametric limits are subject to change.

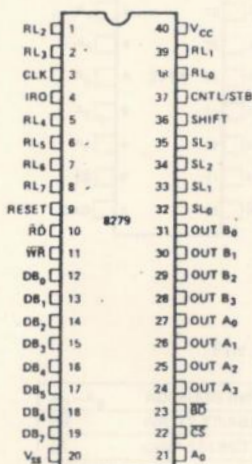
8279/8279-5 PROGRAMMABLE KEYBOARD/DISPLAY INTERFACE

- MCS-85™ Compatible 8279-5
- Simultaneous Keyboard Display Operations
- Scanned Keyboard Mode
- Scanned Sensor Mode
- Strobed Input Entry Mode
- 8-Character Keyboard FIFO
- 2-Key Lockout or N-Key Rollover with Contact Debounce
- Dual 8- or 16-Numerical Display
- Single 16-Character Display
- Right or Left Entry 16-Byte Display RAM
- Mode Programmable from CPU
- Programmable Scan Timing
- Interrupt Output on Key Entry

The Intel® 8279 is a general purpose programmable keyboard and display I/O interface device designed for use with Intel® microprocessors. The keyboard portion can provide a scanned interface to a 64-contact key matrix. The keyboard portion will also interface to an array of sensors or a strobed interface keyboard, such as the hall effect and ferrite variety. Key depressions can be 2-key lockout or N-key rollover. Keyboard entries are debounced and strobed in an 8-character FIFO. If more than 8 characters are entered, overrun status is set. Key entries set the interrupt output line to the CPU.

The display portion provides a scanned display interface for LED, incandescent, and other popular display technologies. Both numeric and alphanumeric segment displays may be used as well as simple indicators. The 8279 has 16X8 display RAM which can be organized into dual 16X4. The RAM can be loaded or interrogated by the CPU. Both right entry, calculator and left entry typewriter display formats are possible. Both read and write of the display RAM can be done with auto-increment of the display RAM address.

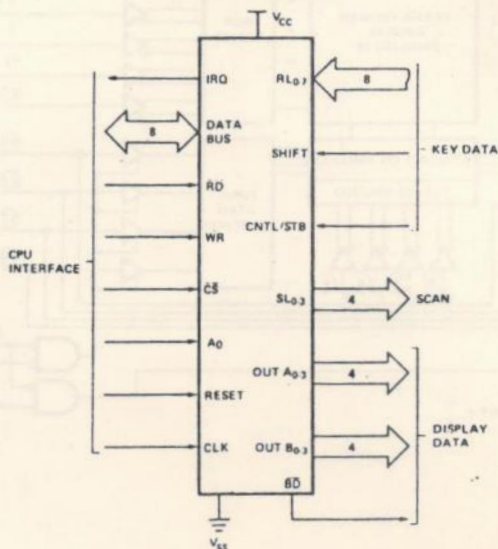
PIN CONFIGURATION



PIN NAMES

Pin	IO	Function
DB _{6,7}	I/O	DATA BUS (BI DIRECTIONAL)
CLK	I	CLOCK INPUT
RESET	I	RESET INPUT
CS	I	CHIP SELECT
RD	I	READ INPUT
WR	I	WRITE INPUT
A ₀	I	BUFFER ADDRESS
IRQ	O	INTERRUPT REQUEST OUTPUT
SL _{0,1}	O	SCAN LINES
RL _{0,1}	I	RETURN LINES
SHIFT	I	SHIFT INPUT
CNTL/STB	I	CONTROL STROBE INPUT
OUT A _{0,1}	O	DISPLAY (A) OUTPUTS
OUT B _{0,1}	O	DISPLAY (B) OUTPUTS
BD	O	BLANK DISPLAY OUTPUT

LOGIC SYMBOL





2114A 1024 X 4 BIT STATIC RAM

	2114AL-2	2114AL-3	2114AL-4	2114A-4	2114A-5
Max. Access Time (ns)	120	150	200	200	250
Max. Current (mA)	40	40	40	70	70

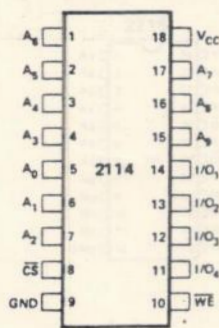
- HMOS Technology
- Low Power, High Speed
- Identical Cycle and Access Times
- Single +5V Supply $\pm 10\%$
- High Density 18 Pin Package
- Completely Static Memory - No Clock or Timing Strobe Required
- Directly TTL Compatible: All Inputs and Outputs
- Common Data Input and Output Using Three-State Outputs
- 2114 Replacement

The Intel 2114A is a 4096-bit static Random Access Memory organized as 1024 words by 4-bits using HMOS, a high performance MOS technology. It uses fully DC stable (static) circuitry throughout, in both the array and the decoding, therefore it requires no clocks or refreshing to operate. Data access is particularly simple since address setup times are not required. The data is read out nondestructively and has the same polarity as the input data. Common input/output pins are provided.

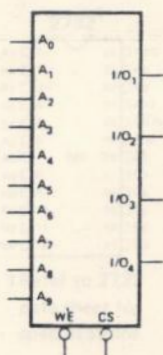
The 2114A is designed for memory applications where the high performance and high reliability of HMOS, low cost, large bit storage, and simple interfacing are important design objectives. The 2114A is placed in an 18-pin package for the highest possible density.

It is directly TTL compatible in all respects: inputs, outputs, and a single +5V supply. A separate Chip Select (\overline{CS}) lead allows easy selection of an individual package when outputs are or-tied.

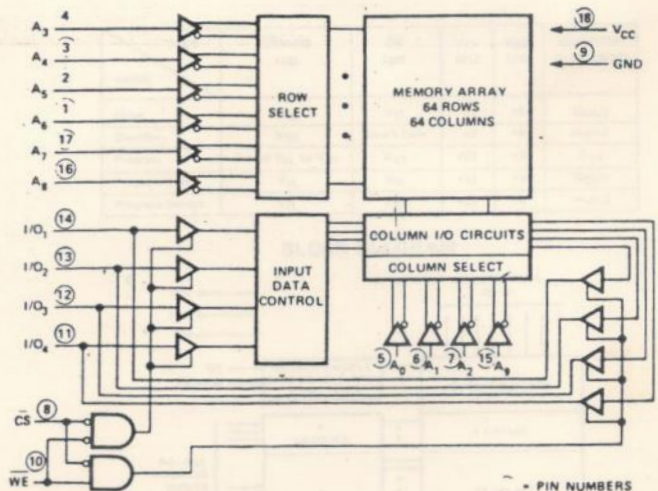
PIN CONFIGURATION



LOGIC SYMBOL



BLOCK DIAGRAM



PIN NAMES

$A_0 - A_9$	ADDRESS INPUTS	V_{CC}	POWER (+5V)
WE	WRITE ENABLE	GND	GROUND
\overline{CS}	CHIP SELECT		
$I/O_1 - I/O_4$	DATA INPUT/OUTPUT		



2716

16K (2K x 8) UV ERASABLE PROM

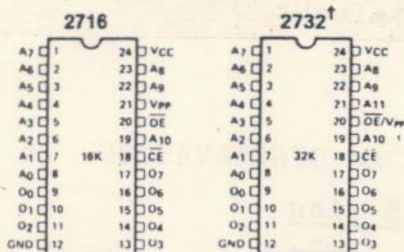
- **Fast Access Time**
 - 350 ns Max. 2716-1
 - 390 ns Max. 2716-2
 - 450 ns Max. 2716
 - 650 ns Max. 2716-6
- **Single +5V Power Supply**
- **Low Power Dissipation**
 - 525 mW Max. Active Power
 - 132 mW Max. Standby Power
- **Pin Compatible to Intel® 2732 EPROM**
- **Simple Programming Requirements**
 - Single Location Programming
 - Programs with One 50 ms Pulse
- **Inputs and Outputs TTL Compatible during Read and Program**
- **Completely Static**

The Intel® 2716 is a 16,384-bit ultraviolet erasable and electrically programmable read-only memory (EPROM). The 2716 operates from a single 5-volt power supply, has a static standby mode, and features fast single address location programming. It makes designing with EPROMs faster, easier and more economical.

The 2716, with its single 5-volt supply and with an access time up to 350 ns, is ideal for use with the newer high performance +5V microprocessors such as Intel's 8085 and 8086. The 2716 is also the first EPROM with a static standby mode which reduces the power dissipation without increasing access time. The maximum active power dissipation is 525 mW while the maximum standby power dissipation is only 132 mW, a 75% savings.

The 2716 has the simplest and fastest method yet devised for programming EPROMs — single pulse TTL level programming. No need for high voltage pulsing because all programming controls are handled by TTL signals. Program any location at any time—either individually, sequentially or at random, with the 2716's single address location programming. Total programming time for all 16,384 bits is only 100 seconds.

PIN CONFIGURATION



† Refer to 2732 data sheet for specifications

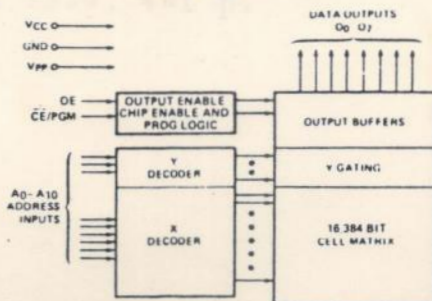
PIN NAMES

A ₀ - A ₁₀	ADDRESSES
CE/PGM	CHIP ENABLE/PROGRAM
OE	OUTPUT ENABLE
O ₀ - O ₇	OUTPUTS

MODE SELECTION

MODE	PINS	CE/PGM (18)	OE (20)	V _{pp} (21)	V _{CC} (24)	OUTPUTS (9-11, 13-17)
Read		V _{IL}	V _{IL}	+5	+5	O _{OUT}
Standby		V _{IH}	Don't Care	+5	+5	High Z
Program		Pulsed V _{IL} to V _{IH}	V _{IH}	+25	+5	D _{IN}
Program Verify		V _{IL}	V _{IL}	+25	+5	O _{OUT}
Program Inhibit		V _{IL}	V _{IH}	+25	+5	High Z

BLOCK DIAGRAM



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