

Technische Information

Philips Data Systems
Unternehmensbereich der
Philips Kommunikations Industrie AG

Sachgebiet: P 3500

Nr.: 017

Modell: P 3500

Hauptbaugruppe: _____

Änderung: RELEASE 2 Techn. Hinweis Allgemein

Bemerkung: _____

Betreff:

INHALTSVERZEICHNISS

Seite 1 von 12	INHALTSVERZEICHNISS UND RELEASE-UMFANG
Seite 2 von 12	INSTALLATIONS-PROZEDUR
Seite 3 von 12	CONFIG MENÜ 01 REGISTRATION
Seite 4 von 12	HILFS-MENÜ ZUR CURSORSTEUERUNG
Seite 5 von 12	CONFIG MENÜ 02 DISK-DRIVES
Seite 6 von 12	CONFIG MENÜ 03 SLAVE-PROZESSOREN
Seite 7 von 12	CONFIG MENÜ 04 EXPANDER CARD CONNECTIONS
Seite 8 von 12	CONFIG MENÜ 05 COMPATIBILITY FLAGS
Seite 9 von 12	CONFIG MENÜ 06 CUSTOMER DISK
Seite 10 von 12	PATCH-LISTE
Seite 11 von 12	DO GEN UND DO CUSTOMER
Seite 12 von 12	DIE KLEINSTE P3500 : P3500-10

RELEASE-UMFANG

Hardware

- SESCO anstelle von FLEXCO und SASI-ADAPTER (dadurch 4 Arbeitsplätze möglich.)
- Neues IPL-Prom auf den PMUs
- Neues Microprogramm im P 2711 (Stand 2.01)
- Extension Kabinetts 5MB und 10MB
- P 3500-10 mit 2 x 320KB Floppy-Disk und 12 Zoll Bildschirm P2705

SOFTWARE

- Neues CONFIG Programm in Menütechnik
- Unterschiedliche Directorygrößen bei 5MB und 10MB
- Es sind 2 Spoolprinter generierbar
- Software auf 320KB Disketten für P 3500-10

INSTALLATIONS-PROZEDUR (AB REL. 2 , FÜR P 3500-20, -30, -40)

01. Montage der Hardware
02. Starten der Kunden-P3500 mit dem -TKSYSTEM-
(Kopie des Tk-TURBODOS der GS)
03. Anpassen des -TKSYSTEMS- an die installierte Kunden-P3500
(CONFIG + DO GEN + aus- und einschalten)
04. Löschen der evt. vorhandenen Festplatte
(Mit ERASEDIR (Rel.2) um das DIRECTORY auf die generierte Größe einzustellen)
 - * (Wenn ein Kunden-System umgeneriert werden muß, und die
 - * DIRECTORY-GRÖßE geändert wird, muß mit COPY die Festplatte
 - * vorher gesichert werden)
05. Testen der Kunden-P3500 mit FETEST (Rel.2) *)
06. Starten und Generieren mit dem STARTER-SYSTEM des Kunden
(CONFIG + DO GEN + aus- und einschalten + DO CUSTOMER +
HWTEST (Rel.2) von der Testprogrammdiskette nach USER 0 des Kunden-Systems kopieren)
07. 2 X Sichern des generierten Kunden-Systems auf Kunden-Disketten
(USER 0 und 31 der Festplatte bzw. der Diskette)
08. Original STARTER-SYSTEM und eine Sicherung des generierten
KUNDEN-SYSTEMS verbleiben beim Kunden.
09. Zweite Sicherung des generierten KUNDEN-SYSTEMS kommt zusammen
mit der CONFIG-LISTE in die Geschäftsstelle zu den Akten des
Kunden
10. Kurzeinweisung des Kunden in HWTEST *)

*) FETEST und HWTEST werden bei Verfügbarkeit nachgeliefert.

CONFIG

3.01 Das dem Kunden gelieferte Starter-System kennt nur folgende Systemkomponenten

1. Disk Drive A	= Flexible Disk
2. Drucker A	= Kanal B - Master/9600bd
3. BILDSCHIRM	= Kanal B - Slave

- a) Das CONFIG in Release 2.0 ist in Menütechnik aufgebaut und umfasst folgende Schritte:
- b) Nach Aufruf von CONFIG in USER 1 erscheint das Eröffnungsbild.
- c) Die Leertaste betätigen, Menü 1 erscheint auf dem Bildschirm.

REGISTRATION

In diesem Menü (SCREEN 01) sind allgemeine Fragen zu beantworten. In der Rubrik "Remarks" ist das zu generierende System zu beschreiben und Besonderheiten festzuhalten. Nur SCREEN 01 ist nach der Generierung als Teil des Betriebssystems in der Datei CONFIG.REG gespeichert.

MENÜ 01 (BEISPIEL)

```

+-----+
ö
ö SCREEN 01          REGISTRATION          P3500 CONFIG rel 2.0  ö
ö
ö Enter TurboDOS serial number : Turbodos Nummer angeben  ö
ö TurboDOS 12NC number         : 8702 402 10120             ö
ö Enter Customer name          : Anwender Name angeben    ö
ö Enter Engineers name         : Techniker Name angeben   ö
ö Enter Branch Office          : Geschäftsstelle Ort angeben ö
ö Enter date (dd-mm-yy)        : Datum angeben             ö
ö Remarks :                                                  ö
ö PROZESSOR      KANAL A          KANAL B                 ö
ö Master                    P 2933                       ö
ö Slave 1                    P 2711                       ö
ö Slave 2      Epson P 2923     P 2711                   ö
ö Drive A      10MB Directorygröße 2KB                    ö
ö Drive B      Flexible Disk 640KB                        ö
ö
ö
ö >>>>> PORTIONS COPYRIGHTED BY MICROSOFT, 1981 <<<<<<   FvdR   ö
ö
+-----+
    
```

HILFSMENÜ ZUR CURSORSTEUERUNG

Den Cursor kann man in den Menüs mit bestimmten Tasten bewegen.
Die Erklärung der Cursorsteuerung ist in einem Hilfsmenü abgespeichert.
Durch betätigen der "HILFE" Taste kann man sich das Hilfsmenü
jederzeit anzeigen lassen.

HILFS-MENÜ

TASTE:	!	AKTION:
WORT LINKS		Feld zurück (nicht im ersten Feld)
WORT RECHTS -TAB- <CR>		Nächstes Feld (nicht im letzten Feld)
DOPPEL PFEIL nach oben		1 Menü zurück (nicht in Menü 01)
DOPPEL PFEIL nach unten		Nächstes Menü (nicht im Menü 06)
ABBRUCH		Erfassungsprogramm beenden
CURSOR nach oben		Feld nach oben
CURSOR nach unten-Linefeed		Feld nach unten
CURSOR links - Backspace		Feld zurück
CURSOR rechts		Positionieren in einem Feld nach links Feld vorwärts
SCHNLL		Positionieren in einem Feld nach rechts Der Cursor springt in das erste Feld im Menü

SLAVE-PROZESSOREN

3.03 Mit der Taste "DOPPEL PFEIL nach unten" kommt man in Menü 03
SLAVE PROZESSOR.

In Menü 03 ist nur die Anzahl der Slave Prozessoren (1-4) anzugeben

Der BATCH Prozessor ist nicht freigegeben daher sind die Fragen
mit "N" zu beantworten.

MENÜ 03 (BEISPIEL)

```
+-----+
ö
ö SCREEN 03          SLAVE PROCESSORS          P3500 CONFIG rel 2.0  ö
ö
ö
ö
ö Enter number of slave processors : 2          ö
ö
ö
ö Usage of specified slave processors as BATCH processor  ö
ö (only 1 BATCH processor allowed per system with at least 2 slaves)  ö
ö Specify a BATCH processor by 'Y', otherwise 'N'        ö
ö
ö SLAVE 1 : N
ö SLAVE 2 : N
ö SLAVE 3 : N
ö SLAVE 4 : N
ö
ö
ö
ö >>>>> PORTIONS COPYRIGHTED BY MICROSOFT, 1981 <<<<<      FvDR  ö
ö
ö
+-----+
```

EXPANDER CARD CONNECTIONS

3.04 Mit der Taste "DOPPEL PFEIL nach unten" kommt man in Menü 04
 EXPANDER CARD CONNECTIONS

Es können jetzt verschiedene Drucker (GP, Epson, TEC) generiert werden.
 Grundsätzlich ist der erste Spooldrucker Drucker A an Kanal B.
 Sollen 2 Spooldrucker generiert werden ist evt. ein Patch notwendig der
 unter Punkt 4.02 (SEITE 10) beschrieben ist.

MENÜ 04 (BEISPIEL)

```

+-----+
ö
ö SCREEN 04                EXPANDER CARD CONNECTIONS    P3500 CONFIG rel 2.0  ö
ö
ö Type:  0-None                3-TEC Printer P5360-02  ö
ö        1-General Printer P2932/P2933/P2934    4-Modem (not on MASTER) ö
ö        2-EPSON Printer P2123                    ö
ö
ö Processor - Channel   Type           Number of queues : 03      ö
ö
ö MASTER                A             0                               ö
ö MASTER                B             1                               ö
ö SLAVE 1               A             0                               ö
ö SLAVE 2               A             2           --> None (0) with less than 2 slaves ö
ö SLAVE 3               A             0           --> None (0) with less than 3 slaves ö
ö SLAVE 4               A             0           --> None (0) with less than 4 slaves ö
ö
ö
ö
ö >>>>> PORTIONS COPYRIGHTED BY MICROSOFT, 1981 <<<<<<      FvdR      ö
ö
+-----+
```

3.05 Bei Rechnerkoppelung ist hier für den gewünschten Slave ein Modem
 anzugeben.
 Siehe dazu PATCH-LISTE auf Seite 10.

COMPATIBILITY FLAGS

3.06 Mit der Taste "DOPPEL PFEIL nach unten" kommt man in Menü 05
COMPATIBILITY FLAGS

Die Flags in diesem Menü sind standartmäßig richtig eingestellt
und werden nur auf besondere Anforderung geändert.

MENÜ 05 (BEISPIEL)

```
+-----+
| 0      |                                     | 0      |
| 0      | SCREEN 05          COMPATIBILITY FLAGS          P3500 CONFIG rel 2.0 | 0      |
| 0      |                                     | 0      |
| 0      |                                     | 0      |
| 0      | PERMISSIVE   SUSPEND   GLOBAL/WRITE   MIXED MODE   LOGICAL | 0      |
| 0      |                                     | 0      |
| 0      | MASTER        Y         N             Y             Y             N | 0      |
| 0      | SLAVE 1       Y         N             Y             Y             N | 0      |
| 0      | SLAVE 2       Y         N             Y             Y             N | 0      |
| 0      | SLAVE 3       Y         N             Y             Y             N | 0      |
| 0      | SLAVE 4       Y         N             Y             Y             N | 0      |
| 0      |                                     | 0      |
| 0      | Specify setting by 'Y', no setting by 'N' | 0      |
| 0      |                                     | 0      |
| 0      | >>>>>> PORTIONS COPYRIGHTED BY MICROSOFT, 1981 <<<<<<          FvdR | 0      |
| 0      |                                     | 0      |
+-----+
```

CUSTOMER DISK

3.07 Mit der Taste "DOPPEL PFEIL nach unten" kommt man in Menü 06
 CUSTOMER DISK

Zur 1. Frage:

Bei Anlagen mit Floppy/Fix Disk muß Drive "A" angegeben werden.
 Bei Anlagen mit Floppy/Floppy muß Drive "B" angegeben werden.

Zur 2. Frage:

Ist noch kein Rel.2 Turbodos Betriebssystem auf der Anwender Disk/Floppy
 so ist die Frage mit "N" zu beantworten.

Zur 3. Frage:

Der Config Summary Report muss immer ausgedruckt werden.
 Frage mit "Y" beantworten.

Zur 4. Frage:

Die REL - Files sollten nicht auf die Anwender Disk/Floppy kopiert
 werden (Platzersparnis). Frage mit "N" beantworten.

Zur 5. Frage:

Müssen Patches eingefügt werden so ist die Frage nach SPECIAL-SYSTEM
 mit "Y" zu beantworten. Siehe dazu unbedingt Seite 10 (PATCH-LISTE).

MENÜ 06 (BEISPIEL)

```

+-----+
ö      SCREEN 06          CUSTOMER DISK          P3500 CONFIG rel 2.0  ö
ö
ö      Enter the customer disk to copy the TurboDOS system to A  (A...P)  ö
ö
ö      Is there already a Release 2.0 version available on          ö
ö      the customer disk ?  N  (y/n)          ö
ö
ö      Do you want to print the CONFIG Summary Report?          Y  (y/n)  ö
ö
ö      Do the relocatable and generation files have to be          ö
ö      copied also ?  N  (y/n)          ö
ö
ö      Do you want to create a special system ?          N  (y/n)          ö
ö
ö      >>>>> PORTIONS COPYRIGHTED BY MICROSOFT, 1981 <<<<<<          FvdR  ö
ö
+-----+
    
```

3.07 Mit der Taste "ABBRUCH" wird das Erfassungs-Programm beendet
 und die CFG-Files erstellt.

PATCH-LISTE

4.01 Patch-Möglichkeiten

Wurde die Frage nach SPECIAL-SYSTEM im letzten Menü mit "Y" beantwortet wird bei jedem CFG-File der generiert wird gefragt ob ein Patch eingefügt werden soll.

Ist innerhalb einer einzufügenden Zeile ein Komma muss diese Zeile in Hochkommas gesetzt werden (zB.: "PTRAST = 01,LSTDRA,00,LSTDRB;").

Mit der Taste "CR" können die CFG-Files übergangen werden in denen keine Änderung erforderlich ist.

4.02 PATCHES in Release 2.0

1. Generierung von 2 Spooldruckern (Epson/GP,GP/GP,Epson/Epson).

Es ist ein SPECIAL-SYSTEM zu generieren und folgende CFG-Files sind zu ändern.

FILE	! PATCH	! ABSCHLUSSTASTE
CFGMASTR.GEN	! PTRDRR ;PRINTER DRIVER	! "CR" "CR"
CFGMASTR.PAR	! LSTBRB = 6E ;BAUD-RATE EPSON/GP 9600BD!	! "CR"
	!"PTRAST = 01,LSTDRA,00,LSTDRB;"	! "CR"
	! DSPPAT = 1,2;	! "CR" "CR"

Die Änderung ist nicht einzufügen bei der Kombination TEC/EPSON oder TEC/GP.

2. Muß ein COMMUNICATION-DRIVER für die Übertragung von z.B. P2000 zur P3500 generiert werden sind folgende Punkte zu beachten.(Übertragung jeweils über Kanal A der PMU)

a.)COMMUNICATION-DRIVER im Master :

Es ist ein SPECIAL-SYSTEM zu generieren und folgendes einzufügen.

FILE	! PATCH	!ABSCHLUSSTASTE
CFGMASTR.GEN	! COMDRV ; COMMUNICATION DRIVER	! "CR" "CR"
CFGMASTR.PAR	! SAIBSZ = (80);	! "CR" "CR"

Zusätzlich muss mit Monitor eine Änderung durchgeführt werden. Bei Floppy/Floppy Anlagen ab Adresse 04ED und bei Floppy/Fix-Disk Anlagen ab Adresse 0587 ändern.

MONITOR	"CR"
L CFGMASTR.GEN	"CR"
E (04ED oder 0587)	"CR"
42 = 41	"CR"
20 = 42	"CR"
	"ESC"
S CFGMASTR.GEN	"CR"
Q	"CR"

Durch diese Änderung wird der Driver SPDRB (für Kanal B) durch den Driver SPDRAB (für Kanal A und B) ersetzt.

Technische Information

Philips Data Systems
Unternehmensbereich der
Philips Kommunikations Industrie AG

Sachgebiet: P 3500

Nr.: 017

b.) COMMUNICATION-DRIVER im Slave :
Für diesen Slave ist in Menü 04 ein Modem zu generieren plus
den Patch:

FILE	! PATCH	! ABSCHLUSSTASTE
CFGSLAVx.GEN	*)! COMDRV ; COMMUNICATION-DRIVER	! "CR" "CR"
CFGSLAVx.PAR	*)! SAIBSZ = (80);	! "CR" "CR"

*) x ist durch die Nummer des CFG-Files, der geändert werden soll, zu
ersetzen.

DO GEN UND DO CUSTOMER

5.01 DO GEN im USER 1 Hierdurch wird das STARTER-SYSTEM an die
Kunden-P3500 angepasst und gleichzeitig das Kunden-System
generiert.

6.01 DO CUSTOMER in USER 1

Ist in Menü 06 die 2. Frage mit "N" beantwortet wird hierdurch der gesamte
USER 0 und 31 des Starter-Systems auf die Fix-Disk/Floppy des Kunden
kopiert plus der Datei OSLOAD.COM aus USER 1 (damit das System
später auch von der FIX-DISK hochfährt).

Wurde die Frage mit "Y" beantwortet, werden nur die OS*.SYS-Dateien
aus USER 0 und aus USER 1 die Datei OSLOAD.COM kopiert.

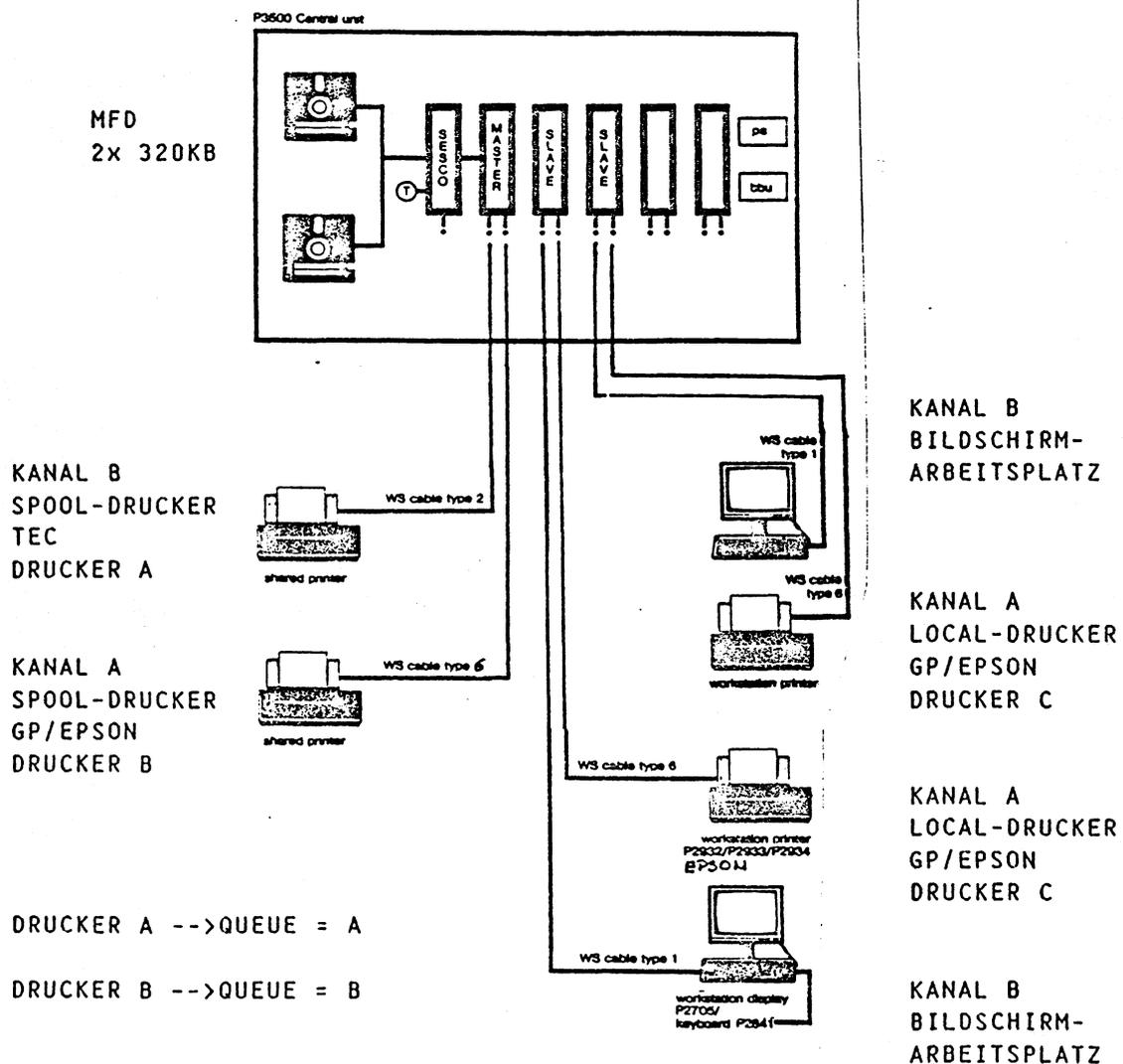
DIE KLEINSTE P 3500 : P3500-10

7.01 P 3500-10

Für das System P 3500-10 bestehend aus einer Zentraleinheit mit 2 X 320KB Floppy und dem Bildschirm P 2705 wird ein fertig generiertes Turbodos Betriebssystem auf 320KB Disketten geliefert.

Hier eine Übersicht über den Umfang des SYSTEMS für die P 3500-10

SINGLE/MULTI-USER TURBODOS



Eine Veränderung dieses SYSTEMS ist nicht möglich!
 Beim Kunden sind 2 Kopien des Systems auf Kundendisketten anzufertigen.

Regenerieren der Distrib.-Disk

USER 0 — Delete OS*.*

USER 1 — Delete Config.REG

USER 1 { Delete CFG*.*
Delete STR*.*
Delete →*.* (Print-Files)

GEN SYSLOADR OSLOAD.COM

GEN SYSLASTR OSMASER.SYS

GEN SYSSLAVE OSSLAVER1.SYS

COPY OS*.* *.* ; SIDONE

Nach einem CONFIG ist die Original Distrib.-Disk verändert.

Mit den o.a. Operationen wird die Distrib.-Disk auf den ursprünglichen Original-Zustand regeneriert.

Man könnte bzw. kann jetzt ein neuer CONFIG fahren!

CONFIG! (Eingaben für eine 8" Floppy)

Spezial System (SCREEN 6)

SPEZIAL SYSTEM?

> █ (1) (2) 1. Eing. 2. Eing.
"DSKAST+9=00,DSKDRC"

2. Eing: "DSKAST+9=00,DSKDRC" <ENTER> maybe

Update U1.62931.1282 (8222 900 50957)

Module F52H "P3500 TURBODOS CONFIGURATION GUIDE"

This Update states the TurboDOS 1.22 amendments for module F52H, valid from Release 1.1 onwards.

MANUAL STATUS SURVEY

Module F52H "P3500 TURBODOS CONFIGURATION GUIDE"

For this manual the following updates have been issued:

- U1.62931.1282 (8222 900 50957; December 1982 update for release 1.1)

software 2000 inc.

1127 Hetrick Avenue • Arroyo Grande, California 93420

TurboDOS 1.22 Documentation Update

December, 1982

Copyright (C) 1982 by Software 2000, Inc.

CONFIGURATION GUIDE REVISIONS

The following revisions should be made to the Configuration Guide to TurboDOS 1.2 (May, 1982):

On page 2-3 (module hierarchy diagram), delete SGLLOG module.

On page 2-6, delete SGLLOG module.

On page 2-7, change length of PATCH module from 64 bytes to 128 bytes.

On page 2-13 (after GEN Command), add:

PACKAGE Command

The PACKAGE command permits you to combine any collection of .REL files into a single .REL file. The command syntax for PACKAGE is identical to the GEN command, except the input filename defaults to type .PKG (instead of .GEN), and the output filename defaults to type .REL. The PACKAGE command may be used to construct custom packages of TurboDOS modules, make additions to the supplied "STD" packages, pre-package collections of driver modules, etc.

On page 2-16 the patch point COMPAT is in FILCOM module, not FILLOK module.

On page 2-17 (in NETMGR module), add the following patch point:

NMBRPS = 0 Number of pre-allocated reply packets

On page 2-17 (in OSLOAD module), add the following patch point:

SCANDN = 0 Scan drives from A-to-P (=0), or P-to-A (=OFF)

TurboDOS 1.22 Documentation Update
Copyright (C) 1982 by Software 2000, Inc.
Configuration Guide Revisions

On page 2-20 (after NMBMBS paragraph), add:

NMBRPS is a byte value that specifies the number of network reply packets to pre-allocate at cold-start time. This value may be left zero, but memory fragmentation may be reduced by assigning a positive value (see NMBMBS above).

On page 2-25, change item 3 as follows:

single-user without spooling: .REL files for STDLOADR and STDSINGL; .COM files for AUTOLOAD, BACKUP, BOOT, BUFFERS, COPY, DATE, DELETE, DIR, DO, DRIVE, DUMP, ERASEDIR, FIXMAP, FORMAT, GEN, LABEL, LOGOFF, LOGON, MONITOR, PACKAGE, PRINT, RELCVT, RENAME, SET, SHOW, TYPE, USER and VERIFY; and .REL files for CPMSUP, OSBOOT, PATCH, RTCNUL, SUBMIT, and all necessary driver modules.

single-user with spooling: .REL files for STDLOADR, STDSINGL and STDSPPOOL; .COM files for AUTOLOAD, BACKUP, BOOT, BUFFERS, COPY, DATE, DELETE, DIR, DO, DRIVE, DUMP, ERASEDIR, FIXMAP, FORMAT, GEN, LABEL, LOGOFF, LOGON, MONITOR, PACKAGE, PRINT, PRINTER, QUEUE, RELCVT, RENAME, SET, SHOW, TYPE, USER and VERIFY; and .REL files for CPMSUP, OSBOOT, PATCH, RTCNUL, SUBMIT, and all necessary driver modules.

multi-user networking: .REL files for STDLOADR, STDSINGL, STDSPPOOL, STDMASTR, STDSLAVE and STDSLAVX; .COM files for AUTOLOAD, BACKUP, BATCH, BOOT, BUFFERS, CHANGE, COPY, DATE, DELETE, DIR, DO, DRIVE, DUMP, ERASEDIR, FIFO, FIXMAP, FORMAT, GEN, LABEL, LOGOFF, LOGON, MASTER, MONITOR, PACKAGE, PRINT, PRINTER, QUEUE, RECEIVE, RELCVT, RENAME, SEND, SET, SHOW, TYPE, USER and VERIFY; and .REL files for CONREM, CPMSUP, OSBOOT, PATCH, RTCNUL, SUBMIT, and all necessary driver modules.

TurboDOS 1.22 Documentation Update
Copyright (C) 1982 by Software 2000, Inc.
Configuration Guide Revisions

On page 3-20 and 3-21 ("Disk Drivers"), change first byte of the disk specification table format as follows:

.BYTE BLKSIZ ;block size (3=1K,..., 7=16K), plus bit 7 = 1 if fixed disk

In Appendix (sample driver listings), substitute newest drivers provided on TurboDOS 1.22 release disk. In particular, note that sample network drivers (MCDxxx and SCDxxx) have been completely rewritten to handle a bidirectional network protocol. Also, a bug has been fixed in the sample serial drivers (SERxxx).

Configuration Guide to TurboDOS 1.2

May, 1982

Copyright (C) 1982 by Software 2000, Inc.

**Copyright (C) 1982 by Software 2000, Inc.
All rights reserved.**

The TurboDOS operating system software and documentation are the proprietary intellectual property of Software 2000, Inc. Copyrights thereon are owned by Software 2000, Inc. and have been registered with the Copyright Office of the Library of Congress in Washington, D.C. The word "TurboDOS" is a trademark of Software 2000, Inc., and has been registered in the United States and in the State of California.

No part of this publication may be reproduced, transmitted, transcribed, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written permission of Software 2000, Inc., 1127 Hetrick Avenue, Arroyo Grande, California 93420, U.S.A.

Software 2000, Inc. makes no representations or warranties with respect to the contents of this publication, and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. Software 2000, Inc. shall under no circumstances be liable for consequential damages or related expenses, even if it has been notified of the possibility of such damages. Software 2000, Inc. reserves the right to revise this publication from time to time without obligation to notify any person of such revision.

NOTE: CP/M, MP/M and CP/NET are trademarks of Digital Research, Inc.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

Table of Contents

TABLE OF CONTENTS

SECTION 1 -- INTRODUCTION

Generating TurboDOS Configurations	1-1
Implementing Driver Modules	1-1
Licensing Requirements	1-2
Serialization	1-3
OEM Responsibilities	1-3
Dealer Responsibilities	1-4
TurboDOS Support	1-4

SECTION 2 -- SYSTEM GENERATION

Module Hierarchy	2-2
Process-Level Modules	2-4
Kernel-Level Modules	2-5
Universal Driver-Level Modules	2-7
Hardware-Dependent Driver-Level Modules	2-8
Standard Configurations	2-8
Estimating Memory Requirements	2-10
Linking and Loading	2-11
GEN Command	2-12
Symbolic Patch Facility	2-14
TurboDOS Patch Points	2-15
Explanations of Certain TurboDOS Patch Points	2-18
Examples of Disk, Printer and Network Tables	2-21
Step-by-Step Procedure for System Generation	2-23
SERIAL Command	2-24
Step-by-Step Procedure for OEM Re-Distribution	2-25

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

Table of Contents

SECTION 3 -- SYSTEM IMPLEMENTATION

Assembler Requirements	3-1
Programming Conventions:	
Dynamic Memory Allocation	3-2
Threaded Lists	3-3
Dispatching	3-4
Interrupt Service Routines	3-6
Poll Routines	3-7
Re-Entrancy and Mutual Exclusion	3-8
Sample Interrupt-Driven Device Driver	3-9
Sample Polled Device Driver	3-10
Initialization Segments	3-11
Page-Oriented Segments	3-11
Inter-Process Messages	3-12
Console Subroutines	3-13
Creating a Resident Process	3-14
Driver Interface Specifications:	
Initialization	3-16
Console Drivers	3-17
Printer Drivers	3-17
Network Circuit Drivers	3-18
Disk Drivers	3-20
Real-Time Clock Driver	3-22
Comm Channel Driver	3-23
Bootstrap ROM	3-24

APPENDIX -- Sample Driver Listings

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

Introduction

INTRODUCTION

This Configuration Guide to TurboDOS provides the information that OEMs, dealers, and sophisticated end-users need to generate various operating system configurations and to implement driver modules for various peripheral components.

A companion document, entitled User's Guide to TurboDOS, provides the information that users need to write and run programs under the TurboDOS operating system. It includes an overview of operating system features, a discussion of architecture and theory of operation, a description of each command, and a definition of each user-callable function.

Generating TurboDOS Configurations

TurboDOS is a modular operating system consisting of more than 40 separate functional modules. These modules are "building blocks" which can be combined in various ways to produce a family of compatible operating systems. TurboDOS configurations include single-task, spooling, network master and network slave, with numerous subtle variations possible in each of these broad categories.

Functional modules of TurboDOS are distributed in relocatable form. Hardware-dependent device drivers are packaged in the same fashion. The GEN command is a specialized linkage editor which may be used to combine the desired combination of modules into an executable version of TurboDOS configured with the desired set of functions and device drivers. The GEN command also includes a symbolic patch facility which may be used to alter a variety of operating system parameters.

Section 2 describes each functional module of TurboDOS in detail, illustrates how these modules can be combined in various configurations, and provides step-by-step system generation procedures.

Implementating Driver Modules

TurboDOS has been designed to run on any Z80-based microcomputer with at least 48K of RAM, a random-access mass storage device, and a full-duplex character-oriented console device (or on an interconnected network of such microcomputers). The functional modules of TurboDOS are not dependent upon the specific peripheral devices to be used. Rather, a set of hardware-dependent device driver modules must be included in each TurboDOS configuration in order to adapt the operating system to the specific hardware environment.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

Introduction

Typical hardware-dependent device driver modules include:

- . Console driver
- . Printer driver
- . Disk driver
- . Network circuit driver
- . Real-time clock driver
- . Communications driver

Although Software 2000 Inc. can supply TurboDOS pre-configured for certain specific hardware configurations, most OEMs and many dealers and end-users will want to implement their own hardware-dependent drivers. Driver modules may be readily written by any competent assembly-language programmer, using a relocating Z80 assembler such as Digital Research's RMAC, Microsoft's MACRO-80, or Phoenix Software Associates' PASM. Section 3 provides detailed instructions to programmers for implementing such driver modules, and the Appendix includes assembly listings of various sample drivers.

Licensing Requirements

TurboDOS is a proprietary software product of Software 2000 Inc. TurboDOS may be used only after the user has paid the required license fee, signed a copy of the TurboDOS software license agreement, and returned the signed agreement to Software 2000 Inc. Then it may be used only in strict conformance with the terms of the software license. Each TurboDOS software license agreement must be filled-out and signed by the end-user (not by an OEM or dealer on his customer's behalf).

Each software license permits the use of TurboDOS only on one specific computer system identified by make, model and serial number. A separate license fee must be paid and a separate license signed for each computer system on which TurboDOS is used. Network slave computers which are also capable of stand-alone operation under TurboDOS must each be licensed separately, but slave computers which cannot be used stand-alone (e.g., because they have no mass storage) do not.

Software 2000 Inc. intends to initiate vigorous legal action against anyone who uses or reproduces TurboDOS software in a manner which is not in strict conformance with the terms of the TurboDOS software license agreement.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

Introduction

Serialization

Each copy of TurboDOS is magnetically serialized with a unique serial number in order to facilitate tracing of unlicensed copies of TurboDOS.

Each relocatable TurboDOS module which is distributed to a dealer or end-user is magnetically serialized with a unique serial number. The serial number consists of two components: an origin number (which identifies the issuing OEM) and a unit number (which uniquely identifies each copy of TurboDOS issued by that OEM). The GEN command verifies that all functional modules which make up a TurboDOS configuration are serialized consistently, and magnetically serializes the resulting executable version of TurboDOS accordingly.

Each relocatable TurboDOS module which is distributed to an OEM is partially serialized with an origin number only. Each OEM is provided with a SERIAL command which must be used to add a unique unit number to the relocatable modules of each copy of TurboDOS issued by that OEM. The GEN command will not accept partially serialized modules that have not been uniquely serialized by the OEM. Conversely, the SERIAL command will not re-serialize modules which have already been fully serialized.

OEM Responsibilities

Each OEM is provided with a master copy of TurboDOS relocatable modules and command processors on diskette. An OEM is authorized to reproduce and distribute copies of TurboDOS to dealers and end-users for use on specifically authorized hardware configurations manufactured or distributed by the OEM. The OEM is required to serialize each copy of TurboDOS with a unique sequential magnetic serial number, and to register each serial number promptly by returning a registration card to Software 2000 Inc. This registration requirement for OEMs is in addition to (not in lieu of) the requirement for licensing of each end-user.

Each OEM is provided with a master copy of TurboDOS documentation either in camera-ready form or in ASCII files on diskette. The OEM is responsible for reproducing the documentation and providing it with each copy of TurboDOS issued by that OEM.

An OEM must require a dealer to sign the TurboDOS dealer agreement and return it to Software 2000 Inc. before the OEM may issue copies of TurboDOS to that dealer. An OEM must require an end-user to sign the TurboDOS software license and return it to Software 2000 Inc. before the OEM may issue a copy of TurboDOS directly to

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

Introduction

that end-user.

Dealer Responsibilities

A TurboDOS dealer is permitted to purchase individual serialized copies of TurboDOS software and documentation from an authorized TurboDOS OEM, and to resell them to end-users. Dealers are not authorized to make copies of TurboDOS software or documentation for any purpose whatever.

A TurboDOS dealer must require each end-user to sign the TurboDOS software license and return it to Software 2000 Inc. before issuing a copy of TurboDOS software or documentation to the end-user.

TurboDOS Support

Software 2000 maintains a telephone "hot-line" to provide TurboDOS-related technical assistance to its OEMs. Authorized TurboDOS OEMs should feel free to take advantage of this service whenever technical questions arise concerning the use or configuration of TurboDOS.

It is the responsibility of each OEM to provide technical support to its dealers and end-user customers. Software 2000 cannot assist dealers or end-users directly. Where exceptional circumstances seem to require direct contact between Software 2000 technical personnel and a dealer or end-user, this must be handled strictly by prior arrangement with Software 2000 by the OEM.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

SYSTEM GENERATION

TurboDOS is a modular operating system consisting of more than 40 separate functional modules. These modules are "building blocks" which can be combined in various ways to produce a family of compatible operating systems. TurboDOS configurations include single-task, spooling, time-sharing and networking, with numerous subtle variations possible in each of these broad categories. This section describes each functional module of TurboDOS in detail, illustrates how these modules can be combined in various configurations, and provides step-by-step system generation procedures.

Functional modules of TurboDOS are distributed in relocatable form. Hardware-dependent device drivers are packaged in the same fashion. The GEN command processor is a specialized linkage editor which may be used to bind together the desired combination of modules into an executable version of TurboDOS configured with the desired set of functions and device drivers. GEN also includes a symbolic patch facility which may be used to alter a variety of operating system parameters.

To simplify the the system generation process, the most commonly used combinations of TurboDOS functional modules are pre-packaged into several standard configurations. Most requirements for TurboDOS can be satisfied by linking the appropriate standard package together with the requisite hardware-dependent drivers.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Module Hierarchy

The flow diagram on the facing page illustrates the functional inter-relationship of TurboDOS modules. As the diagram shows, the software elements of TurboDOS can be viewed as a three-level hierarchy.

The highest level is known as the "process" level. TurboDOS can support many concurrent processes at this level, and can share the resources of the local computer among them. There are active processes for users who are executing commands and/or transient programs on the local computer. There are also processes for users who are running on remote computers but making network requests of the local computer. There are processes to support de-spooling on local printers. Finally, there is a process which periodically causes buffered disk records to be flushed (i.e., written out) to disk.

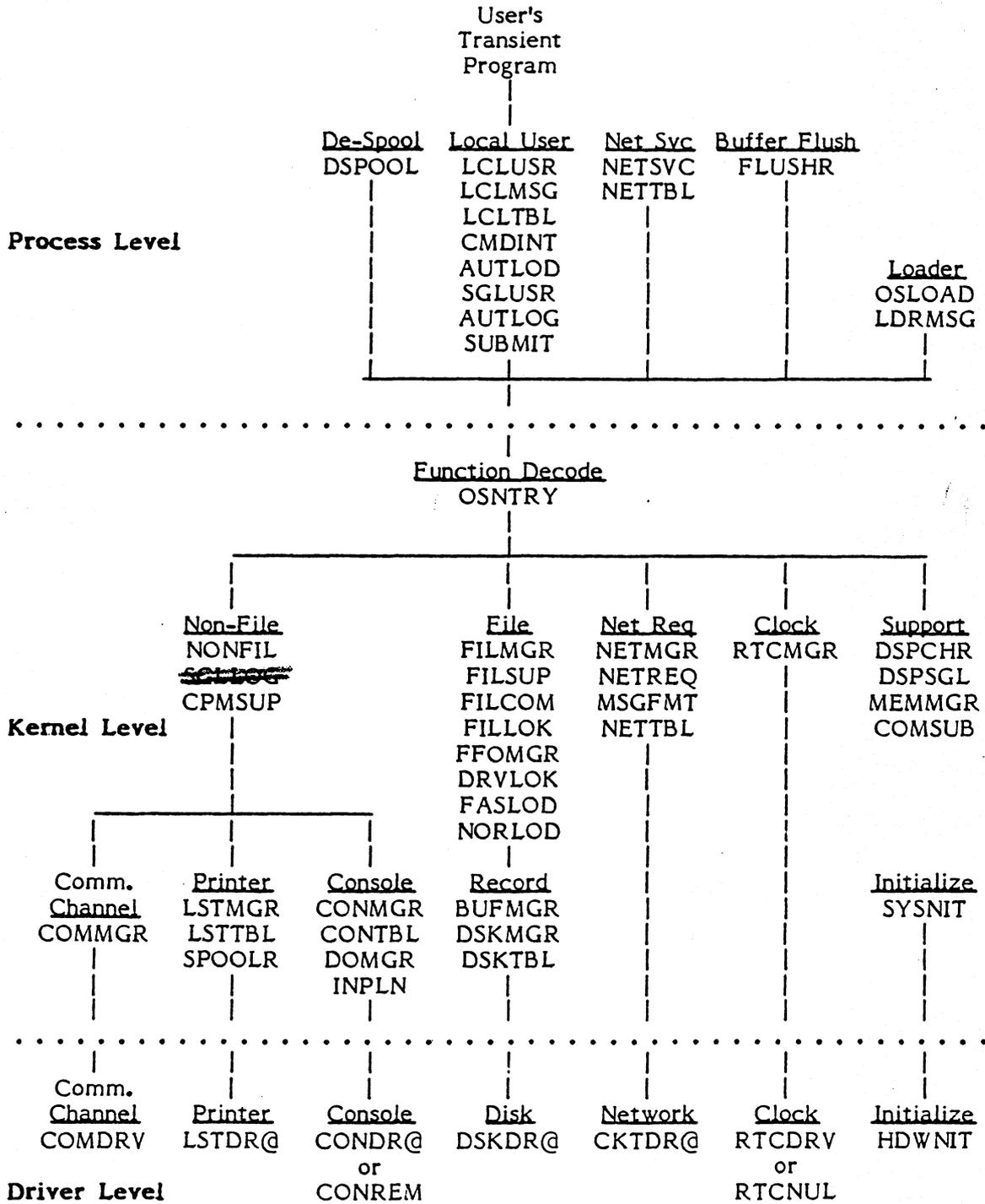
The intermediate level is known as the "kernel" level. The kernel supports the various numbered TurboDOS functions (about 100 of them), and controls the sharing of microcomputer resources such as processor time, memory, peripheral devices, and disk files. Processes make requests of the kernel through a single entrypoint (OSNTRY) which decodes each function by number and invokes the appropriate module in the kernel.

The lowest level is known as the "driver" level, and contains all of the device-dependent drivers necessary to interface TurboDOS to a particular configuration of microcomputer hardware. Drivers must be provided for each printer, console, disk controller, and network interface. A driver is also required for the real-time clock or other periodic interrupt source (used for time-slicing among processes and for timing of delays). TurboDOS operates most efficiently with interrupt-driven, buffered or DMA-type devices, but can also work satisfactorily with polled and programmed-I/O devices.

The TurboDOS loader OSLOAD.COM is a special program which contains an abbreviated version of the kernel and drivers. Its purpose is to load the full operating system into memory at each system start-up.

All TurboDOS process-level and kernel-level modules permit re-entrant execution in multi-process situations. Most driver-level modules are not re-entrantly coded, and must utilize a mutual-exclusion mechanism to prevent re-entrant execution.

Configuration Guide to TurboDOS 1.2
 Copyright (C) 1982 by Software 2000, Inc.
 System Generation



TurboDOS Module Hierarchy

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Process-Level Modules

LCLUSR -- Supports a transient program area for a user of the local microcomputer.

LCLMSG -- Contains all operating system messages, which are segregated into a separate module to facilitate adaptation to other languages.

LCLTBL -- Local user initialization tables.

CMDINT -- Command interpreter routine called by LCLUSR to process local user commands and multi-command strings.

AUTLOD -- Automatic program load routine called by LCLUSR to process COLDSTRT.AUT and WARMSTRT.AUT files if they are present.

SGLUSR -- Buffer flushing routine called by LCLUSR to flush and unlink all disk buffers at every console input. Included in single-user configurations only.

AUTLOG -- Automatic log-on routine called by LCLUSR to automatically log-on the local user in configurations where logon/logoff security is not desired. To activate this feature, use the symbolic patch facility to patch the public symbol AUTUSR to the desired user number, with the sign-bit set for a privileged log-on (typically AUTUSR = 80).

SUBMIT -- Optional module which emulates the processing by CP/M of \$\$\$SUB files (not recommended due to significant performance penalty).

NETSVC -- Network service process which receives and services network requests from other microcomputers.

NETTBL -- Tables which define the topology of the network as seen from a particular processor.

DSPOOL -- De-spool process which supports printing of spooled print jobs concurrent with other system activities. In multi-printer configurations, there is a separate re-entrant instance of the DSPOOL process for each printer.

FLUSHR -- Buffer flusher process which causes memory-resident disk buffers to be flushed (i.e., written out) to disk periodically.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Kernel-Level Modules

OSNTRY -- Common kernel entrypoint which decodes each function by number and invokes the appropriate module in the kernel.

FILMGR -- File manager which processes requests involving local files.

FILSUP -- File support routines used by FILMGR.

FILCOM -- Processors for common file-oriented functions which are never sent over the network.

FILLOK -- File- and record-level interlock routines called by FILMGR.

FFOMGR -- FIFO management routines called by FILLOK.

DRVLOK -- Drive interlock routines.

FASLOD -- Program load optimizer.

NORLOD -- Non-optimized program load routine which may be used instead of FASLOD when memory space is at a premium.

BUFMGR -- Buffer manager called by FILMGR. It maintains a pool of memory-resident record buffers used for all record-oriented access to local disk storage.

DSKMGR -- Disk manager called by BUFMGR and FASLOD to perform physical accesses to local disk storage.

DSKTBL -- Tables which define how drive letters are mapped into local and remote drives, and the location on the network of any remote drives.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

NONFIL -- Non-file request manager which handles kernel requests which are not file-oriented.

CPMSUP -- Optional function processors for little-used functions (7, 8, 24, 28, 29, 31, 37, and 107) included in TurboDOS solely for compatibility with CP/M.

~~**SGLLOG** -- Optional module which may be included in multi-user configurations to prevent two or more non-privileged users from logging on to the same user number concurrently.~~

CONMGR -- Console manager which handles local console input/output.

CONTBL -- Table which defines how the local console is interfaced.

DOMGR -- DO-file manager which handles activation of DO-files. When a DO-file is active, this module is called by CONMGR to satisfy console input requests from the DO-file.

INPLN -- Console input line editor used for buffered console input (function 10), and used by CMDINT.

LSTMGR -- List manager which handles printer-oriented functions.

LSTTBL -- Tables which define how printer and queue letters are mapped into local and remote printers and queues, and the location on the network of any remote printers and queues.

SPOOLR -- Spooler routine which diverts print output to spool files when the spooler is activated. Also handles direct printing to remote printers.

COMMGR -- Comm channel manager which handles the communications channel.

NETREQ -- Network request processor which creates network request messages to be passed to remote processors for service.

MSGFMT -- Network message format table used by NETREQ.

NETMGR -- Network message routing mechanism used by NETSVC and NETREQ.

NETTBL -- Tables which define the topology of the network as seen from a particular processor.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

RTCMGR -- Real-time clock manager which maintains system date and time.

DSPCHR -- Multi-process dispatcher which controls the sharing of local processor time among multiple competing processes:

DSPSGL -- Null dispatcher used as an alternative to DSPCHR when only one process is required (e.g., in OSLOAD.COM and in minimal single-user configurations without spooling).

MEMMGR -- Memory manager which controls the dynamic allocation and deallocation of memory segments.

COMSUB -- Common subroutines utilized in all configurations.

SYSNIT -- System initialization routine which is executed at system start-up.

PATCH -- Optional module consisting of ¹²⁸~~64~~ bytes of zeroes which may be included to provide space for any required operating system patches.

Universal Driver-Level Modules

RTCNUl -- Null real-time clock driver for use in configurations in which there is no periodic interrupt source.

CONREM -- Remote console driver for network master to allow access from slave consoles by means of the MASTER command.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Hardware-Dependent Driver-Level Modules

Driver modules are hardware-dependent, and may vary significantly from one TurboDOS implementation to another. In general, the following drivers are required as a minimum:

CONDR@ -- Console driver allows character-by-character input from a console keyboard and output to a console display.

LSTDR@ -- Printer driver allows character-by-character output to a hardcopy peripheral. TurboDOS supports multiple printer drivers.

COMDRV -- Comm. channel driver allows character-by-character input and output over one or more communications channels.

DSKDR@ -- Disk controller driver allows input and output of physical-records on a random-access mass storage device (usually flexible or hard disk). TurboDOS supports multiple disk controller drivers, each of which may support multiple drives.

CKTDR@ -- Network circuit driver allows sending and receiving messages to or from remote processors. TurboDOS supports multiple network circuit drivers, each of which may communicate with multiple remote processors.

RTCDRV -- Real-time clock driver services interrupts from a periodic interrupt source, used for time-slicing, delay measurement, and updating the system date and time.

HDWNIT -- Hardware initialization routine called by SYSNIT. This module usually consists of calls to initialization entrypoints in other drivers.

Standard Configurations

To simplify the the system generation process, the most commonly used combinations of TurboDOS functional modules are pre-packaged into the standard configurations shown in the table on the facing page: STDLOADR, STDSINGL, STDSPOOL, STDMASTR, STDSLAVE and STDSLAVX. Most requirements for TurboDOS can be satisfied by linking the appropriate standard package together with the requisite driver modules.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

<u>Module</u>	<u>Size</u> <u>Kb</u>	<u>O/S Loader</u> <u>STDLOADR</u>	<u>Single User</u> <u>STDSINGL</u>	<u>Single User</u> <u>w/Spooling</u> <u>STDSPool</u>	<u>Network</u> <u>Master</u> <u>STDMASTR</u>	<u>Simple</u> <u>Slave</u> <u>STDSLAVE</u>	<u>Complex</u> <u>Slave</u> <u>STDSLAVX</u>
LCLUSR	.9	-	LCLUSR	LCLUSR	LCLUSR	LCLUSR	LCLUSR
LCLMSG	.1	-	LCLMSG	LCLMSG	LCLMSG	LCLMSG	LCLMSG
LCLTBL	.0	-	LCLTBL	LCLTBL	LCLTBL	LCLTBL	LCLTBL
CMDINT	.9	-	CMDINT	CMDINT	CMDINT	CMDINT	CMDINT
AUTLOD	.2	-	AUTLOD	AUTLOD	AUTLOD	AUTLOD	AUTLOD
SGLUSR	.1	-	SGLUSR	SGLUSR	-	-	SGLUSR
AUTLOG	.0	-	AUTLOG	AUTLOG	AUTLOG	AUTLOG	AUTLOG
SUBMIT	.1	-	-	-	-	-	-
NETSVC	1.0	-	-	-	NETSVC	-	-
DSPOOL	.8	-	-	DSPOOL	DSPOOL	-	DSPOOL
FLUSHR	.2	-	-	-	FLUSHR	-	-
OSLOAD	1.4	OSLOAD	-	-	-	-	-
LDRMSG	.1	LDRMSG	-	-	-	-	-
OSNTRY	.4	OSNTRY	OSNTRY	OSNTRY	OSNTRY	OSNTRY	OSNTRY
FILMGR	1.4	FILMGR	FILMGR	FILMGR	FILMGR	-	FILMGR
FILSUP	1.9	FILSUP	FILSUP	FILSUP	FILSUP	-	FILSUP
FILCOM	.2	FILCOM	FILCOM	FILCOM	FILCOM	FILCOM	FILCOM
FILLOK	1.3	-	-	-	FILLOK	-	-
FFOMGR	.7	-	-	-	FFOMGR	-	-
DRVLOK	.2	-	-	-	DRVLOK	-	-
FASLOD	.3	-	FASLOD	FASLOD	FASLOD	-	FASLOD
NORLOD	.1	-	-	-	-	-	-
BUFMGR	1.0	BUFMGR	BUFMGR	BUFMGR	BUFMGR	-	BUFMGR
DSKMGR	.6	DSKMGR	DSKMGR	DSKMGR	DSKMGR	-	DSKMGR
DSKTBL	.0	DSKTBL	DSKTBL	DSKTBL	DSKTBL	DSKTBL	DSKTBL
NONFIL	.1	NONFIL	NONFIL	NONFIL	NONFIL	NONFIL	NONFIL
SGLLOG	.1	-	-	-	-	-	-
CPMSUP	.2	-	-	-	-	-	-
CONMGR	.3	CONMGR	CONMGR	CONMGR	CONMGR	CONMGR	CONMGR
CONTBL	.0	CONTBL	CONTBL	CONTBL	CONTBL	CONTBL	CONTBL
DOMGR	.3	-	DOMGR	DOMGR	DOMGR	DOMGR	DOMGR
INPLN	.1	-	INPLN	INPLN	INPLN	INPLN	INPLN
LSTMGR	.1	-	LSTMGR	LSTMGR	LSTMGR	LSTMGR	LSTMGR
LSTTBL	.1	-	LSTTBL	LSTTBL	LSTTBL	LSTTBL	LSTTBL
SPOOLR	.4	-	-	SPOOLR	SPOOLR	SPOOLR	SPOOLR
COMMGR	.1	-	COMMGR	COMMGR	COMMGR	COMMGR	COMMGR
NETREQ	.9	-	-	-	-	NETREQ	NETREQ
MSGFMT	.1	-	-	-	-	MSGFMT	MSGFMT
NETMGR	.3	-	-	-	NETMGR	NETMGR	NETMGR
NETTBL	.0	-	-	-	NETTBL	NETTBL	NETTBL
RTCMGR	.1	-	RTCMGR	RTCMGR	RTCMGR	-	RTCMGR
DSPCHR	.6	-	-	DSPCHR	DSPCHR	DSPCHR	DSPCHR
DSPSGL	.1	DSPSGL	DSPSGL	-	-	-	-
MEMMGR	.3	-	MEMMGR	MEMMGR	MEMMGR	MEMMGR	MEMMGR
COMSUB	.2	COMSUB	COMSUB	COMSUB	COMSUB	COMSUB	COMSUB
SYSNIT	.0	-	SYSNIT	SYSNIT	SYSNIT	SYSNIT	SYSNIT

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Estimating Memory Requirements

To estimate memory requirements for a particular TurboDOS configuration, it is necessary to take into account the combined size of functional modules (see table on previous page), hardware-dependent driver modules, disk buffers and other dynamically allocated storage segments.

Hardware-dependent drivers typically require 1K to 3K of memory, depending on the complexity of the hardware involved. Disk buffer space should be as large as possible for optimum performance, especially in a network master. About 4K of disk buffer space is acceptable for a single-user system, although less can be used in a pinch. Other dynamic storage usually doesn't exceed 1k in a single-user system, 2K in a networking system.

The following table gives typical memory requirements of standard TurboDOS configurations:

	O/S Loader	Single User	Single User w/Spooling	Network Master	Simple Slave	Complex Slave
	<u>STDLOADR</u>	<u>STDSINGL</u>	<u>STDSPOOL</u>	<u>STDMASTR</u>	<u>STDSLAVE</u>	<u>STDSLAVX</u>
TurboDOS	8K	10K	12K	15K	7K	14K
Drivers	2K	2K	2K	3K	1K	3K
Disk Buffers	4K	4K	4K	16K	0K	4K
Dynamic Space	<u>+1K</u>	<u>+1K</u>	<u>+1K</u>	<u>+3K</u>	<u>+2K</u>	<u>+2K</u>
Total Size	15K	17K	19K	37K	10K	23K
TPA (in 64K)	n/a	47K	45K	27K	54K	41K

Typical TurboDOS Memory Requirements

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Linking and Loading

Functional modules of TurboDOS are distributed in relocatable form. Hardware-dependent device drivers are packaged in the same fashion. The GEN command processor is a specialized linkage editor which may be used to bind together the desired combination of modules into an executable version of TurboDOS configured with the desired set of functions and device drivers. GEN also includes a symbolic patch facility which may be used to alter a variety of operating system parameters.

To generate a TurboDOS system, the GEN command must be used to create both an executable loader OSLOAD.COM and an executable master operating system OSMaster.SYS. In networking configurations, the GEN command must also be used to create a slave operating system OSSlave.SYS. The GEN command can also be used to generate the code for a start-up PROM (or boot track).

At system start-up, the start-up PROM (or boot track) loads the loader program OSLOAD.COM into the TPA of the master computer and executes it. OSLOAD loads the master operating system OSMaster.SYS into the topmost portion of memory. In networking configurations, the master operating system down-loads the slave operating system OSSlave.SYS into the slave computers on the network.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

GEN Command

The GEN command is used for TurboDOS system generation (and may also be used as a general purpose linker for Microsoft-format .REL modules). It links a collection of relocatable modules together into a single executable file. The command format is:

```
GEN filename1 filename2 ;options
```

where "filename1" specifies the name of the configuration file (type .GEN) and parameter file (type .PAR) to be used, and "filename2" specifies the name of the executable file (normally type .COM or .SYS) to be created. If "filename2" is omitted from the command line, then "filename1" is used for the executable file and should include an explicit file type (.COM or .SYS).

If the configuration file (type .GEN) is found, it must contain the list of relocatable files to be linked together. If the configuration file is not found, then the GEN command operates in an interactive mode, reading successive directives from the console until terminated by a null directive. The format of each directive (or each line of the configuration file) is:

```
relfile1, relfile2, ..., relfileN
```

The GEN command links together all of the specified modules, a two-pass process which displays the name of each module as it is encountered. At the end of the second pass, the GEN command looks for a parameter file (type .PAR) and processes it (if found). Finally, the executable file is written out to disk.

Each relocatable TurboDOS module is magnetically serialized with a unique serial number. The serial number consists of two components: an origin number (which identifies the issuing OEM) and a unit number (which uniquely identifies each copy of TurboDOS issued by that OEM). The GEN command verifies that all modules to be linked are serialized consistently, and serializes the executable file accordingly.

The ";options" argument may contain either ";Lxxxx" or ";Uxxxx" to define either the lower or upper boundary of the executable program ("xxxx" is a hexadecimal memory address). The default boundary is ";L0100" if the output file is of type .COM, and ";UFFFF" if the output file is of type .SYS.

The ";options" argument may also contain ";X" to display undefined symbol references (quite normal in TurboDOS system generation), ";M" to print a load map on the printer, and ";S" to print a full symbol table on the printer.

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Generation

Example:

The following example uses the GEN command to link the modules listed in OSMASTER.GEN and the patch parameters in OSMASTER.PAR, creating the executable file OSMASTER.SYS.

```
0A)GEN OSMASTER.SYS :UBFFF
* STDSINGL, CON192, LSTCTS, SPD442
* SER480, BRT442O, RTC442
* DSK401, DSTBL8, HDWNIT
Pass 1.
LCLUSR      LCLTBL      CMDINT      AUTLOD      SGLUSR      AUTLOG
OSNTRY      FILMGR      FILSUP      FASLOD      BUFMGR      DSKMGR
DSKTBL      NONFIL      CONMGR      CONTBL      DOMGR       INPLN
LSTMGR      LSTTBL      COMMGR      RTCMGR      DSPSGL      MEMMGR
COMSUB      SYSNIT      CON192      LSTCTS      SPD442      SER480
BRT442      RTC442      DSK401      DSTBL8      HDWNIT
Pass 2.
LCLUSR      LCLTBL      CMDINT      AUTLOD      SGLUSR      AUTLOG
OSNTRY      FILMGR      FILSUP      FASLOD      BUFMGR      DSKMGR
DSKTBL      NONFIL      CONMGR      CONTBL      DOMGR       INPLN
LSTMGR      LSTTBL      COMMGR      RTCMGR      DSPSGL      MEMMGR
COMSUB      SYSNIT      CON192      LSTCTS      SPD442      SER480
BRT442      RTC442      DSK401      DSTBL8      HDWNIT
Processing parameter file:
AUTUSR = 80
NMBUFS = 8
PTRAST = 2
EOPCHR = 1A
SRHDRV = 1
Writing output file.
0A}
```

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Symbolic Patch Facility

The GEN command supports a symbolic patch facility which may be used to override various operating system parameters as well as to effect necessary software corrections. Symbolic patches must be stored in a parameter file (type .PAR), which may be built using any ordinary file editor. The format of each .PAR file entry is:

```
location = value1, value2, ..., valueN ;comments
```

where "value1" through "valueN" are to be loaded into consecutive memory locations starting with "location".

The argument "location" may be a public symbol name, a hexadecimal number, or an expression composed of names and hexadecimal numbers connected by "+" or "-". Hexadecimal numbers must begin with a decimal digit (e.g., "0FFFF"). The location expression must be followed by an equal-sign character.

The arguments "value1" through "valueN" may be expressions (as defined above) or quoted ASCII strings, and must be separated by commas. An expression is stored as a 16-bit word if its value exceeds 255 or if it is enclosed in parentheses; otherwise, an expression is stored as an 8-bit byte. A quoted ASCII string may be enclosed by either quotes or apostrophes, and is stored as a sequence of 8-bit bytes. Within a quoted string, ASCII control characters may be specified by using the circumflex (e.g., "^X" denotes CTRL-X).

Example:

```
CLBLEN = 9D      ;Command line buffer length (157)
CLSCHR = "\"     ;Command line separator character
ATNCHR = "^S"   ;Attention character
LOADFN = 0,"OSMASTER","SYS" ;File name to load
DSKAST = 00,DSKDRA,01,DSKDRA,00,DSKDRB,80,(0000),81,(0000)
```

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Generation

TurboDOS Patch Points

Public symbols in the hardware-independent portion of TurboDOS which may be useful to patch are shown below, together with their default (unpatched) values. (Other patchable symbols may exist in hardware-dependent drivers, and are beyond the scope of this document.)

In AUTLOD Module:

LDCOLD = OFF Cold-start autoloader enable flag (0 to disable)
LDWARM = OFF Warm-start autoloader enable flag (0 to disable)
COLDFN = 0,"COLDSTRT","AUT"
 Cold-start autoloader file name (12 bytes)
WARMFN = 0,"WARMSTRT","AUT"
 Warm-start autoloader file name (12 bytes)

In AUTLOG Module:

AUTUSR = OFF Automatic log-on user number (sign-bit if privileged)

In BUFMGR Module:

BUFSIZ = 3 Default buffer size (0=128, 1=256, 2=512, ..., 7=16K)
NMBUFS = 4 Default number of buffers

In CMDINT Module:

CLBLEN = 9D Command line buffer length (default 2*80-3 = 157)
CLSCHR = "\" Command line separator character
CLPCHR = "j" Command line prompt character
SRHDRV = 0 Search drive (0=off, 1="A", 2="B", ..., 0FF=sysdisk)

In CONTBL Module:

ATNCHR = "^S" Attention character
ATNBEL = "^G" Attention-received warning
RESCHR = "^Q" Resume character (attention response)
ABTCHR = "^C" Abort character (attention response)
ECHOCHR = "^P" Echo character (attention response)
PRTCHR = "^L" End-print character (attention response)
CONAST = 00,CONDRA
 Console assignment table

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

In DSKTBL Module:

DSKAST = 00,DSKDRA,01,DSKDRA,0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
Disk assignment table (master, 16 3-byte entries)

In FILCOM Module:

LOGUSR = 1F User number for log-off (standard is 31)

In FILLOK Module:

COMPAT = 00 File/record locking compatibility flags

In FLUSHR Module:

BFLDLY = (012C) Buffer flush delay (in ticks, no flush if zero)

In LCLTBL Module:

PRTMOD = 1 Default print mode (0=direct, 1=spooled, 2=console)
QUEPTR = 1 Default queue/printer (0=off, 1="A", 2="B", ...)
SPLDRV = 0FF Default pool drive (0="A", 1="B", ..., 0FF=sysdisk)

In LCLUSR Module:

MEMRES = (0100) Reserved memory above TPA

In LSTTBL Module:

EOPCHR = 0 End-of-print character (if nonzero)
DSPPAT = 1,...,1 De-spool printer assignment table (16 bytes)
PTRAST = 00,LSTDRA,0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
Printer assignment table (master, 16 3-byte entries)
QUEAST = 00,(0),0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
0FF,(0),0FF,(0),0FF,(0),0FF,(0)
Queue assignment table (master, 16 3-byte entries)

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Generation

In MEMMGR Module:

MEMBLL = (1103) Memory base lower limit (standard assures 4K TPA)

In NETMGR Module:

NMBMBS = 0 Number of pre-allocated message buffers

In NETSVC Module:

NMBSVC = 2 Number of NETSVC server processes activated

SLVFN = "OSSLAVE ","SYS"
Name of .SYS file to download

In NETTBL Module:

NMBCKT = 1 Number of network circuits

DEFDID = (0) Default network destination ID

CKTAST = (0000),CKTDRA,(0100),CKTDRB,(0200),CKTDRC,(0300),CKTDRD
Circuit assignment table (NMBCKT 4-byte entries)

FWDTBL = OFF,OFF,OFF,OFF,OFF,OFF,OFF,OFF,OFF
Forwarding table (2-byte entries)

In NONFIL Module:

CPMVER = 30 CP/M BDOS version number (returned by function 12)

In OSLOAD Module:

LOADFN = 0,"OSMASTER","SYS"
Default drive and filename for OSLOAD (12 bytes)

MEMTOP = (0FFFF) Top limit of OSLOAD RAM test (don't test if zero)

In SUBMIT Module:

SUBFN = 0,"\$\$\$ ","SUB"
Submit file name

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

NOTE: In slave configurations STDSLAVE and STDSLAVX, the following default values change:

In DSKTBL Module:

DSKAST = 80,(0),81,(0),82,(0),83,(0)
84,(0),85,(0),86,(0),87,(0)
88,(0),89,(0),8A,(0),8B,(0)
8C,(0),8D,(0),8E,(0),8F,(0)

Disk assignment table (slave, 16 3-byte entries)

In LSTTBL Module:

PTRAST = 80,(0),81,(0),82,(0),83,(0)
84,(0),85,(0),86,(0),87,(0)
88,(0),89,(0),8A,(0),8B,(0)
8C,(0),8D,(0),8E,(0),8F,(0)

Printer assignment table (slave, 16 3-byte entries)

QUEAST = 80,(0),81,(0),82,(0),83,(0)
84,(0),85,(0),86,(0),87,(0)
88,(0),89,(0),8A,(0),8B,(0)
8C,(0),8D,(0),8E,(0),8F,(0)

Queue assignment table (slave, 16 3-byte entries)

Explanations of Certain TurboDOS Patch Points

AUTUSR may be patched to cause an automatic log-on at cold-start time (rather than the usual password-protected log-on procedure). If automatic log-on is desired, patch AUTUSR to the desired user number (00...1F) and set the sign-bit if a privileged log-on is desired. The patch "AUTUSR = 80" should generally be included in single-user configurations to cause an automatic privileged log-on to user number zero.

SRHDRV may be patched to cause TurboDOS to automatically search another drive for a command processor (.COM file) if it is not found on the current default drive. Patch SRHDRV to 1 to search drive "A", 2 to search drive "B", etc. Alternatively, patch SRHDRV to 0FF to search the system disk drive (i.e., whichever drive was used to boot up TurboDOS).

ATNCHR defines the keyboard character interpreted by TurboDOS as an "attention" request. It should be patched if the usual "^S" conflicts with the needs of applications (such as WordStar). A common alternative choice is ATNCHR = "^@" which allows the BREAK key to be used for attention on many systems.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

CONAST is a 3-byte entry which defines how console input/output is handled. The first byte is passed to the console driver module, and commonly defines the channel number (e.g., serial port) to be used for the console. The next word specifies the entrypoint address of the console driver to be used.

DSKAST is an array of sixteen 3-byte entries, one for each drive letter A...P, which define whether the corresponding drive is local, remote, or invalid.

- . For a local drive, the first byte must not have the sign-bit set. That byte is passed to the disk driver module, and is commonly used to differentiate between multiple drives connected to a single controller. The next word specifies the entrypoint address of the disk driver to be used.
- . For a remote drive, the first byte must have the sign-bit set. The low-order bits of that byte specifies the drive letter to be accessed on the remote processor. The next word specifies the network address of the remote processor.
- . For an invalid drive, the first byte must be 0FF, and the next word should be zero.

DSPPAT is an array of sixteen bytes, one for each printer letter A...P, which defines the initial de-spool queue to which each printer is assigned. Byte values 1...16 correspond to queues A...P, and zero means that the corresponding printer is initialized to off-line.

PTRAST is an array of sixteen 3-byte entries, one for each printer letter A...P, which define whether the corresponding printer is local, remote, or invalid.

- . For a local printer, the first byte must not have the sign-bit set. That byte is passed to the list driver module, and commonly defines the channel number (e.g., serial port) to be used for the printer. The next word specifies the entrypoint address of the list driver to be used.
- . For a remote printer, the first byte must have the sign-bit set. The low-order bits of that byte specifies the printer letter to be accessed on the remote processor. The next word specifies the network address of the remote processor.
- . For an invalid printer, the first byte must be 0FF, and the next word should be zero.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

QUEAST is an array of sixteen 3-byte entries, one for each queue letter A...P, which define whether the corresponding queue is local, remote, or invalid.

- . For a local queue, all three bytes must be set to zero.
- . For a remote queue, the first byte must have the sign-bit set. The low-order bits of that byte specifies the queue letter to be accessed on the remote processor. The next word specifies the network address of the remote processor.
- . For an invalid queue, the first byte must be OFF, and the next word should be zero.

EOPCHR may be patched to any non-null ASCII character, in which case the presence of that character in the print output stream will automatically signal an end-of-print-job condition.

NMBMBS is a byte value that specifies the number of network message buffers to pre-allocate at cold-start time. This value may be left at zero, but memory fragmentation may be reduced by assigning a positive value (NMBCKT plus two is a good value to try).

NMBSVC is a byte value that specifies the number of NETSVC server processes to be created (the number of slave processors is a good value to try).

CKTAST is a table of 4-byte (2-word) entries. There are NMBCKT entries, one for each network circuit to which this processor is attached. The first word of each entry specifies the network address by which this processor is known on a particular circuit, and the second word specifies the entypoint address of the circuit driver responsible for that circuit. (Possibly, several circuits may be handled by the same driver.)

FWDTBL is a table of 2-byte entries which define any explicit message forwarding routes which this processor may utilize. The first byte of each entry specifies a circuit number "N" which is not directly connected to this processor, and the second byte specifies a corresponding circuit number "C" which is directly-connected. Any network messages destined for circuit "N" will be routed via circuit "C". This table is variable length (possibly empty), and must be terminated with a byte OFF.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.
System Generation

Examples of Disk, Printer and Network Tables

Suppose we wish to generate a TurboDOS configuration in which disk drives A...E are to be defined as follows: Drive A is a local hard disk. Drives B and C are local floppies. Drives D and E are remote drives belonging to another processor whose network address is 05-09 (circuit 5, node 9), and are known to that processor as its drives A and B. The .GEN file would include disk driver modules for both hard disk and floppy controllers:

```
..., DSKHARD, DSKFLOP, ...
```

and the .PAR file would set up the disk assignment table for drives A...E as:

```
DSKAST = 00,DSKDRA, 00,DSKDRB, 01,DSKDRB, 80,(0509), 81,(0509)
```

Furthermore, suppose printers A...E are to be defined as follows: Printers A and B are serial printers using XON/XOFF protocol and connected to serial channels 1 and 2. Printers C and D are serial printers using CTS handshaking and connected to serial channels 3 and 4. Printer E is a remote printer belonging to the processor at network address 02-01 (circuit 2, node 1) and known to that processor as printer B. The .GEN file would include printer drivers for both XON/XOFF and CTS:

```
..., LSTXON, LSTCTS, ...
```

and the .PAR file would set up the printer assignment table for printers A...E as:

```
PTRAST = 01,LSTDRA, 02,LSTDRA, 03,LSTDRA, 04,LSTDRA, 81,(0201)
```

If de-spooled printing is desired on all five printers, with one queue defined per printer (four local queues and one remote queue), then the .PAR file might set up the queue and de-spool printer assignment tables as:

```
QUEAST = 0,(0), 0,(0), 0,(0), 0,(0), 81,(0201)  
DSPPAT = 1,2,3,4,5
```

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Finally, suppose this processor is connected to two network circuits, a high-speed circuit (#5) and a low-speed circuit (#2). Suppose further that this processor is known on the high-speed circuit as network address 05-07, and on the low-speed circuit as network address 02-06. Suppose also that one of the other processors on circuit #5 can forward messages to circuits #8 and #9. The .GEN file would include network circuit drivers for both high- and low-speed circuits:

..., CKTHIGH, CKTLOW, ...

and the .PAR file might set up the network tables as follows:

```
NMBCKT = 2
CKTAST = (0507),CKTDRA,(0206),CKTDRB
DEFDID = (0509)
FWDTBL = 08,05, 09,05, 0FF
```

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

Step-by-Step Procedure for System Generation

To generate a new version of TurboDOS, the following steps may be followed:

1. Bring up a single-user operating system, either CP/M or (preferably) a previous version of TurboDOS. If you are using CP/M, all diskettes will have to be in a format compatible with both CP/M and TurboDOS (e.g., eight-inch, one-sided, single-density, 128-byte sector size).
2. Make a working copy of your TurboDOS distribution diskette. Do not use the original diskette (in case something goes wrong). Insert the working diskette in a convenient disk drive.
3. Using an editor, create or revise the file OSMASTER.GEN containing the names of the relocatable files to be linked together. In most cases, this will consist of the appropriate STDxxxxx file plus all required device drivers.
4. Using an editor, create or revise the file OSMASTER.PAR containing any required patches. This may be omitted if no patches are desired.
5. Using the command "GEN OSMASTER.SYS", generate an executable system file. If the target machine has less than 64K of memory installed, don't forget to specify a ";Uxxxx" option on the GEN command.
6. If you need to generate a new O/S loader, create or revise the files OSLOAD.GEN and OSLOAD.PAR, and use the command "GEN OSLOAD.COM" to generate an executable loader file.
6. If you need to generate a new slave O/S for a networking configuration, create or revise the files OSSLAVE.GEN and OSSLAVE.PAR, and use the command "GEN OSSLAVE.SYS" to generate an executable down-load file.
7. To test the newly generated system, log onto your working diskette, eject all other diskettes, and enter the command "OSLOAD". If the new system fails to come up or to function properly, you will have to start over at step 1; there is most likely an error in one of your .GEN or .PAR files.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

SERIAL Command

Each relocatable TurboDOS module which is distributed to an OEM is partially serialized with an origin number only. Each OEM is provided with a SERIAL command processor which must be used to add a unique unit number to the relocatable modules of each copy of TurboDOS issued by that OEM.

The format of the SERIAL command is:

```
SERIAL srcfile destfile ;Unnn options
```

where "srcfile", "destfile" and "options" have exactly the same meanings as in the COPY command, and "nnn" is the unit number expressed as a decimal integer. The SERIAL command works exactly like the COPY command, except that it has the additional function of magnetically serializing .REL files.

The GEN command will not accept partially serialized modules that have not been uniquely serialized by the OEM. Conversely, the SERIAL command will not re-serialize modules which have already been fully serialized.

Example:

```
0A)SERIAL A: B: ;U289 N  
A:ASSIGN.COM copied to B:ASSIGN.COM  
.  
.  
.  
A:USER.COM copied to B:USER.COM  
0A}
```

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Generation

Step-by-Step Procedure for OEM Re-Distribution

To generate a serialized copy of TurboDOS for re-distribution by an OEM to a dealer or end-user, the following steps must be followed:

1. Assign a unique sequential unit number for this copy of TurboDOS, and register it promptly by filling-out a serial number registration card and mailing it to Software 2000 Inc.
2. Initialize a new diskette, and label it with the TurboDOS version number, the origin and unit numbers, and the required notice "Copyright (C) 1982 by Software 2000, Inc."
3. Using the SERIAL command, copy and serialize the following files from your OEM redistribution master to the new diskette:

single-user without spooling: .REL files for STDLOADR and STDSINGL; .COM files for AUTOLOAD, BACKUP, BOOT, BUFFERS, COPY, DATE, DELETE, DIR, DO, DRIVE, DUMP, ERASEDIR, FIXMAP, FORMAT, GEN, LABEL, LOGOFF, LOGON, MONITOR, PRINT, RENAME, SET, SHOW, TYPE, USER, and VERIFY; and .REL files for all necessary driver modules.

single-user with spooling: .REL files for STDLOADR, STDSINGL, and STDSPOOL; .COM files for AUTOLOAD, BACKUP, BOOT, BUFFERS, COPY, DATE, DELETE, DIR, DO, DRIVE, DUMP, ERASEDIR, FIXMAP, FORMAT, GEN, LABEL, LOGOFF, LOGON, MONITOR, PRINT, PRINTER, QUEUE, RENAME, SET, SHOW, TYPE, USER, and VERIFY; and .REL files for all necessary driver modules.

multi-user networking: .REL files for STDLOADR, STDSINGL, STDSPOOL, STDMASTR, and STDSLAVE; .COM files for AUTOLOAD, BACKUP, BATCH, BOOT, BUFFERS, CHANGE, COPY, DATE, DELETE, DIR, DO, DRIVE, DUMP, ERASEDIR, FIFO, FIXMAP, FORMAT, GEN, LABEL, LOGOFF, LOGON, MASTER, MONITOR, PRINT, PRINTER, QUEUE, RECEIVE, RENAME, SEND, SET, SHOW, TYPE, USER, and VERIFY; and .REL files for all necessary driver modules.

Important Note: Be certain that the new diskette does not contain unserialized modules or SERIAL.COM.

4. Using the new serialized diskette, generate an executable loader and operating system, using the system generation procedure described earlier in this section.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Generation

5. In addition to the serialized diskette, the dealer or end-user should receive a TurboDOS start-up PROM (if applicable) and copies of the User's Guide and Configuration Guide.

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Implementation

SYSTEM IMPLEMENTATION

TurboDOS has been designed to run on any Z80-based microcomputer with at least 48K of RAM, a random-access mass storage device, and a full-duplex character-oriented console device (or on an interconnected network of such microcomputers). The process-level and kernel-level modules of TurboDOS do not depend upon the specific peripheral devices to be used. Rather, a set of hardware-dependent device driver modules must be included in each TurboDOS configuration in order to adapt the operating system to a particular hardware environment. Device drivers are typically required for consoles, printers, disk controllers, network interfaces, real-time clock, and communications.

Although Software 2000 Inc. can supply TurboDOS pre-configured for certain specific hardware configurations, most OEMs and many dealers and end-users will want to implement their own hardware-dependent drivers. Driver modules may be readily written by any programmer competent in Z80 assembly-language. This section provides detailed instructions to programmers for implementing such driver modules, and the Appendix includes assembly listings of various sample drivers.

Assembler Requirements

Drivers must be written using a Z80 assembler capable of producing relocatable modules with symbolic linkage information in the industry-standard Microsoft relocatable module format. Both Microsoft's MACRO-80 and Digital Research's RMAC assemblers have these characteristics, and are well suited for implementing TurboDOS drivers.

Phoenix Software Associates' (PSA) assembler (formerly TDL and Xitan) is an excellent relocatable Z80 assembler, but it produces object modules in a non-standard format. To alleviate this problem, a conversion utility (RELCVT.COM) is available from Software 2000 Inc. for converting PSA-format object modules to standard Microsoft format. The command

RELCVT filename

converts the PSA-format .REL file specified by "filename" into standard Microsoft .REL format. Wherever the characters "." and "%" appear in names in the PSA-format module, they are replaced by the characters "?" and "@ " (respectively) in the Microsoft-format module.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Programming Conventions

Assembly-language examples in this section and in the Appendix are all coded for the PSA assembler. In the examples, the name suffix "#" is used to reference an external name that is defined in another module. The label suffix "::" is used to define a public name that is available for reference in other modules. Some assemblers require that such names be declared in an EXTERN or PUBLIC statement. Program, data, and common segments are introduced with a .LOC statement in the examples. Some assemblers use different statements (e.g., CSEG, DSEG, COMMON) to accomplish the same thing. Also, the symbol "." represents the current location counter value; some assemblers use "\$" or "*" instead.

Dynamic Memory Allocation

The resident portion of TurboDOS resides in the topmost portion of system memory. TurboDOS uses a common memory management module (MEMMGR) to provide dynamic allocation and de-allocation of memory space required for disk buffers, de-spool requests, file interlocks, DO-file nesting, etc. Dynamic memory segments are allocated downward from the base of the TurboDOS resident area, thereby reducing the space available for the transient program area (TPA). Deallocated segments are concatenated with any neighbors and threaded on a free list. A best-fit algorithm is used to reduce memory fragmentation.

Allocation and de-allocation of memory segments is accomplished in this manner:

```
LXI      H,36          ;get size of requested segment in HL
CALL     ALLOC#        ;allocate segment
ORA      A             ;was segment allocated successfully?
JNZ      ERROR        ;if not, error
PUSH     H             ;else, segment base address in HL
.
.
.
POP      H             ;get address of memory segment in HL
CALL     DEALOC#       ;de-allocate segment
```

ALLOC# prefixes each dynamic memory segment with a word containing the segment length, so that DEALOC# can tell how much memory is to be de-allocated. ALLOC# does not zero the newly allocated segment.

Configuration Guide to TurboDOS 1.2
 Copyright (C) 1982 by Software 2000, Inc.
 System Implementation

Threaded Lists

All dynamic structures in TurboDOS are maintained as threaded lists with bidirectional linkages. This technique permits a node to be easily added or deleted anywhere in a threaded list without searching. The list head and each list node must contain a two-word linkage (forward pointer and backward pointer).

Manipulation of threaded lists is accomplished in this manner:

```

LSTHED:                ;list head (initialized to empty)
    .WORD    .          ;forward pointer
    .WORD    -2         ;backward pointer
;
LSTNOD:                ;list node
    .WORD    0          ;forward pointer
    .WORD    0          ;backward pointer
    .BLKB    128        ;node body
    .
    .
    .
    LXI     H,LSTHED    ;get list head address in HL
    LXI     D,LSTNOD    ;get new node address in DE
    CALL    LNKEND#     ;link node to end of list
    .
    .
    .
    LXI     H,LSTNOD    ;get node address in HL
    CALL    UNLINK#     ;unlink node from list
    .
    .
    .
    LXI     H,LSTHED    ;get list head address in HL
    LXI     D,LSTNOD    ;get new node address in DE
    CALL    LNKBEGB#    ;link node to beginning of list
  
```

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Dispatching

TurboDOS incorporates an extremely efficient and flexible mechanism for dispatching the Z80 microprocessor among various competing processes. In writing device drivers for TurboDOS, the programmer must take extreme care to use the dispatcher correctly in order to attain maximum performance.

Basically, the dispatcher enables one process to wait for some event (e.g., character available, operation complete) while allowing other processes to utilize the microprocessor. For each such event, the programmer must define a three-word structure called an "event semaphore". A semaphore consists of a count-word followed by a two-word list head. The count-word is used by the dispatcher to keep track of the status of the event, while the list head defines a threaded list of processes waiting for the event.

There are two fundamental operations which affect an event semaphore: waiting for the event to occur (WAIT#), and signalling that the event has occurred (SIGNAL#). These are coded in the following manner:

```
EVENT:                ;event semaphore
    .WORD    0          ;semaphore count
    .WORD    .          ;semaphore list forward pointer
    .WORD    -2         ;semaphore list backward pointer
    .
    .
    LXI     H,EVENT    ;get event semaphore address
    CALL    WAIT#      ;wait until event occurs
    .
    .
    LXI     H,EVENT    ;get event semaphore address
    CALL    SIGNAL#     ;signal that event has occurred
```

Whenever a process waits on an event semaphore, WAIT# decrements the count-word of the semaphore. Thus, a negative count of -N signifies that there are N processes waiting for that event to occur. Whenever the occurrence of an event is signalled, SIGNAL# increments the count-word of the semaphore and awakens the process that has been waiting longest.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

If the occurrence of an event is signalled but no process is waiting for it, then SIGNAL# simply increments the count-word to a positive value. Thus, a positive count N signifies that there have been N occurrences of the event for which no process was waiting. In this case, the next N calls to WAIT# on that semaphore will return immediately without waiting.

Sometimes it is necessary for a process to wait for a specific time interval (e.g., head-settle delay, carriage-return delay) rather than for the occurrence of a specific event. The TurboDOS dispatcher provides a delay facility (DELAY#) which permits other processes to use the microprocessor while one process is waiting for such a time interval to expire. Delay intervals are measured in an implementation-defined unit called a "tick"; in most implementations, ticks occur 50 or 60 times per second. Delays may be coded in the following manner:

```
      .  
      .  
      .  
      LXI      H,6          ;get number of ticks to delay  
      CALL    DELAY#      ;delay for specified interval  
      .  
      .  
      .
```

A delay of zero ticks may be specified to effect a very short delay, or simply to relinquish the processor to other processes on a "courtesy" basis.

For best performance, all driver delays should be accomplished by means of WAIT# (wait for an event to be signalled) or DELAY# (wait for a given interval of time to elapse). Drivers should never be coded to spin in a wait loop.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Interrupt Service Routines

The TurboDOS dispatching mechanism is especially efficient when used with interrupt-driven peripheral devices. In most situations, the interrupt service routine simply calls SIGNAL# to indicate that the event associated with the interrupt has occurred.

Service routines for low-frequency interrupts (no more than 100 times per second) should exit by means of the standard interrupt service routine exit ISRXIT# in order to provide frequent time-slicing of processes. Service routines for high-frequency interrupts (occurring more than 100 times per second) should simply enable interrupts and return, in order to avoid excessive dispatch overhead.

It is good programming practice for interrupt service routines to set up an auxiliary stack, in order to avoid the possibility of overflowing the stack area of a user's program. TurboDOS provides a standard interrupt stack area (INTSTK#) and stack pointer save location (INTSP#) for this purpose.

A simple interrupt service routine for a low-frequency interrupt could be coded in this manner:

```
DEVISR:  SSPD      INTSP#      ;save user's stack pointer
         LXI      SP,INTSTK#  ;set up auxiliary stack
         PUSH     PSW         ;save all registers
         PUSH     B
         PUSH     D
         PUSH     H
         IN      STATUS      ;reset the interrupt condition
         LXI      H,EVENT    ;get event semaphore address
         CALL     SIGNAL#    ;signal that event has occurred
         POP      H          ;restore all registers
         POP      D
         POP      B
         POP      PSW
         LSPD     INTSP#     ;restore user's stack pointer
         JMP     ISRXIT#    ;exit through dispatcher
```

In more complex interrupt situations, it may be necessary for an interrupt service routine to determine which of several possible events occurred, and to signal one of several alternative semaphores. Sometimes it may be desirable for an interrupt service routine to perform a data buffering function (e.g., to provide keyboard type-ahead).

Configuration Guide to TurboDOS 1.2
 Copyright (C) 1982 by Software 2000, Inc.
 System Implementation

Poll Routines

Peripheral devices which are not capable of interrupting the processor must be polled by the device driver. To facilitate this, the TurboDOS dispatcher maintains a threaded list of poll routines, and executes the routines on the list at every dispatch. The function of each poll routine is to check the status of its peripheral device, and to signal the occurrence of an event (e.g., character available, operation complete) when it occurs. The routine LNKPOL# can be called at any time to link a new poll routine onto the poll list.

The only tricky thing about a poll routine is that it must be coded in such a fashion that it will not signal the occurrence a particular event more than once. This can be accomplished in various ways, but a most efficient method is for the poll routine to simply unlink itself from the dispatcher's poll list as soon as it has signalled the occurrence of an event. This can be accomplished in the following manner:

```

EVENT:                                ;event semaphore
      .WORD    0                        ;semaphore count
      .WORD    .                        ;semaphore list forward pointer
      .WORD    -2                       ;semaphore list backward pointer
      .
      .
      LXI     D,POLNOD                  ;get poll routine node address
      CALL    LNKPOL#                   ;link poll routine onto poll list
      CALL    POLRTN                    ;pre-test peripheral status (optional)
      LXI     H,EVENT                   ;get event semaphore address
      CALL    WAIT#                     ;wait until event occurs
      .
      .
POLNOD: .WORD    0                        ;poll routine node linkage
      .WORD    0
POLRTN: IN     STATUS                   ;get peripheral status
      ANI     MASK                      ;is input character available?
      RZ                                           ;if not, exit
      LXI     H,EVENT                   ;else, get event semaphore address
      CALL    SIGNAL#                   ;signal that event has occurred
      LXI     H,POLNOD                  ;get poll routine node address
      CALL    UNLINK#                   ;unlink poll routine from poll list
      RET                                           ;done
  
```

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Re-Entrancy and Mutual Exclusion

All TurboDOS process-level and kernel-level modules permit re-entrant execution by multiple processes. However, most driver-level modules are not coded re-entrantly (since most peripheral devices can only do one thing at a time). Consequently, most drivers must make use of a mutual-exclusion interlock to prevent re-entrant execution.

Using the TurboDOS event semaphore mechanism, such a mutual-exclusion interlock can be implemented very simply in the following manner:

```
MXLOCK:                                ;mutual-exclusion interlock semaphore
      .WORD 1                            ;semaphore count (initialized to 1!)
      .WORD .                            ;semaphore list head forward pointer
      .WORD -2                          ;semaphore list head backward pointer
;
DRIVER: LXI    H,MXLOCK                  ;get interlock semaphore address
        CALL   WAIT#                    ;wait if driver is already in use
        .
        .
        LXI    H,MXLOCK                  ;get interlock semaphore address
        CALL   SIGNAL#                   ;signal driver no longer in use
        RET                                     ;done
```

Note that the interlock semaphore count-word must be initialized to 1 (instead of 0) for this scheme to work properly.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Sample Interrupt-Driven Device Driver

The following is a simple device driver for an interrupt-driven serial input device. It illustrates the coding techniques described previously:

```
MXLOCK:      .WORD 1      ;mutual-exclusion interlock semaphore
              .WORD .      ;semaphore count (initialized to 1!)
              .WORD -2     ;semaphore list head forward pointer
              .WORD -2     ;semaphore list head backward pointer
;
EVENT:       .WORD 0      ;event semaphore
              .WORD .      ;semaphore count
              .WORD -2     ;semaphore list forward pointer
              .WORD -2     ;semaphore list backward pointer
;
CHRSAV:      .BYTE 0      ;input character save location
;
DRIVER:      LXI H,MXLOCK ;get interlock semaphore address
              CALL WAIT#  ;wait if driver is already in use
              EI          ;ensure that interrupts are enabled
              LXI H,EVENT ;get event semaphore
              CALL WAIT#  ;wait for event to occur
              LDA CHRSAV  ;get input character
              PUSH PSW    ;save on stack
              LXI H,MXLOCK ;get interlock semaphore address
              CALL SIGNAL# ;signal driver no longer in use
              POP PSW    ;return input character in A-register
              RET        ;done
;
DEVISR:      SSPD INTSP#   ;save user's stack pointer
              LXI SP,INTSTK# ;set up auxilliary stack
              PUSH PSW      ;save all registers
              PUSH B
              PUSH D
              PUSH H
              IN STATUS    ;get peripheral status
              ANI MASK     ;is input character available?
              JRZ ..X      ;if not, exit
              IN DATA     ;else, get input character
              STA CHRSAV   ;save input character
              LXI H,EVENT  ;get event semaphore address
              CALL SIGNAL# ;signal that event has occurred
..X:         POP H         ;restore all registers
              POP D
              POP B
              POP PSW
              LSPD INTSP#  ;restore user's stack pointer
              JMP ISRXIT#  ;exit through dispatcher
```

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Sample Polled Device Driver

The following is a simple device driver for a polled serial input device. It illustrates the coding techniques described previously:

```
MXLOCK:                ;mutual-exclusion interlock semaphore
    .WORD 1             ;semaphore count (initialized to 1!)
    .WORD .             ;semaphore list head forward pointer
    .WORD -2            ;semaphore list head backward pointer
;
EVENT:                 ;event semaphore
    .WORD 0             ;semaphore count
    .WORD .             ;semaphore list forward pointer
    .WORD -2            ;semaphore list backward pointer
;
CHRSAV: .BYTE 0        ;input character save location
;
DRIVER: LXI H,MXLOCK   ;get interlock semaphore address
        CALL WAIT#    ;wait if driver is already in use
        LXI D,POLNOD  ;get poll routine node address
        CALL LNKPOL#  ;link poll routine onto poll list
        CALL POLRTN   ;pre-test peripheral status (optional)
        LXI H,EVENT   ;get event semaphore address
        CALL WAIT#    ;wait until event occurs
        LDA CHRSAV    ;get input character
        PUSH PSW      ;save on stack
        LXI H,MXLOCK  ;get interlock semaphore address
        CALL SIGNAL#  ;signal driver no longer in use
        POP PSW       ;return input character in A-register
        RET           ;done
;
POLNOD: .WORD 0        ;poll routine node linkage
        .WORD 0
POLRTN: IN STATUS     ;get peripheral status
        ANI MASK      ;is input character available?
        RZ            ;if not, exit
        IN DATA      ;else, get input character
        STA CHRSAV    ;save input character
        LXI H,EVENT   ;else, get event semaphore address
        CALL SIGNAL#  ;signal that event has occurred
        LXI H,POLNOD  ;get poll routine node address
        CALL UNLINK#  ;unlink poll routine from poll list
        RET           ;done
```

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Implementation

Initialization Segments

In programming hardware-dependent driver modules, it is frequently necessary to include a considerable amount of initialization code which is executed only once (at system start-up) and never needed again. TurboDOS provides a space-saving mechanism whereby such initialization code may be loaded and executed in lower memory (TPA), instead of becoming part of the resident operating system. To use this feature, each initialization segment must be assembled under a special location counter (i.e., common block) named ?INIT? (or .INIT.# if PSA assembler and RELCVT are used):

```
                .LOC      .INIT.#      ;initialization segment follows
;
HDWNIT:: XRA      A                ;start of initialization code
        .
        .
        .
        RET                ;end of initialization code
;
```

Page-Oriented Segments

Sometimes, a programmer must force a segment of code or data to begin on a 256-byte page boundary. Examples are interrupt vectors for Z80 IM2, and the simulated CP/M BIOS branch table. To do this, a page-oriented segment must be assembled under a special location counter (i.e., common block) named ?PAGE? (or .PAGE.# if PSA assembler and RELCVT are used). If several modules utilize the ?PAGE? location counter, then a separate page is allocated for each such module.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Inter-Process Messages

For passing messages from one process to another, TurboDOS makes use of a five-word structure called a "message node". A message node consists of a three-word event semaphore followed by a two-word message list head. Subroutines are provided for sending messages to a message node (SNDMSG#), and receiving messages from a message node (RCVMSG#). Typically, the sending process allocates a segment of dynamic memory in which to build the message, and the receiving process deallocates the segment after making use of the message:

```
MSGNOD:      .WORD    0           ;message node
              .WORD    .           ;semaphore count
              .WORD   -2          ;semaphore list forward pointer
              .WORD    .           ;semaphore list backward pointer
              .WORD    .           ;message list forward pointer
              .WORD   -2          ;message list backward pointer

SEND:        LXI      H,12        ;get size of message to send
              CALL    ALLOC#      ;allocate message packet
              PUSH    H           ;save message packet address
              .
              .                   ;build message in packet
              .
              POP     D           ;get address of message packet in DE
              LXI    H,MSGNOD     ;get address of message node in HL
              CALL    SNDMSG#     ;send inter-process message
              .
              .
              .

REC:         LXI      H,MSGNOD     ;get address of message node in HL
              CALL    RCVMSG#     ;receive inter-process message
              PUSH    H           ;save message packet address
              .
              .                   ;read message in packet
              .
              POP     H           ;get address of message packet in HL
              CALL    DEALOC#     ;deallocate message packet
              .
              .
              .
```

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Console Subroutines

The following illustrates the use of various console-related subroutines which may be called from within driver modules:

	CALL	CONST#	;returns console status in A-reg
	ORA	A	;is console input available?
	RZ		;if not, exit
	CALL	CONIN#	;returns console input in A-reg
	CALL	UPRCAS#	;convert lower-case letters to upper-case
	MOV	C,A	;move character to C-reg
	CALL	CONOUT#	;displays character passed in C-reg
..MSG:	CALL	DMS#	;display following message
	.ASCIS	"Message"	;last byte of message has sign-bit set
	LXI	H,..MSG	;HL -> sign-bit-terminated message
	CALL	DMSHL#	;display message pointed-to by HL
	LXI	H,31416	;HL has any 16-bit value
	CALL	DECOUT#	;displays HL value in decimal

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Creating a Resident Process

In some circumstances, it may be desirable to activate a resident process which runs in the background concurrent with other system activities. The create-process subroutine CRPROC# may be called to create such a process at system initialization time as illustrated below:

```

                .LOC      .INIT.#      ;initialization segment follows
;
HDWNIT::
                LXI      D,BACKGR      ;hardware-dependent initialization
                CALL     CRPROC#      ;get process entryptoint address
                ;create process
                .
                .
                .

                .LOC      .PROG.#      ;program segment follows
;
BACKGR:
                LXI      D,60*60      ;background process starts here
                MVI      C,125      ;number of ticks in one minute
                CALL     OSNTRY#      ;number of "delay process" function
                ;delay for one minute
                LXI      D,..FCB      ;get FCB address
                MVI      C,15      ;number of "open file" function
                CALL     OSNTRY#      ;open the file
                ORA      A      ;was file opened successfully?
                JRNZ     BACKGR      ;if not, try again in a minute
                ;otherwise, ...
                .
                .
                .
..FCB:          .BYTE      0      ;file control block
                .ASCII    "FILENAME"
                .ASCII    "TYP"
                .BYTE      [24]0
```

The CRPROC# routine automatically assigns a TurboDOS work area whose address appears to the new process in the X-register, and a 64-word stack area whose address appears in the SP-register. If the process requires a re-entrant work area (usually dynamically allocated), its address should be passed to CRPROC# in the HL-register and will appear to the new process in the Y-register.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.
System Implementation

Note that the resident process must make all its operating system requests in exactly the same fashion as a transient program would, except that the operating system entrypoint OSNTRY# is used instead of location 0005H. This is very important. A resident process must not make direct calls to kernel-level subroutines such as WAIT#, SIGNAL#, DELAY#, SNDMSG#, RCVMSG#, ALLOC#, DEALOC#, DMS#, etc. Also, a resident process is not attached to a console, so any console input/output operations it issues will be ignored.

A resident process must preserve index register X, but may use other registers as desired.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Driver Interface Specifications

The interface specifications for various kinds of device drivers are described below. Drivers may be packaged into as many or few separate modules as desired by the programmer. In general, it is easier to reconfigure TurboDOS for a wide variety of peripheral devices if the driver for each device is packaged as a separate module.

TurboDOS may be configured with multiple disk, console, printer and network drivers. The disk driver entrypoint table refers to disk driver entrypoints DSKDRA#, DSKDRB#, DSKDRC#, etc. Each disk driver should be coded with a public entrypoint DSKDR@:: (or DSKDR%:: if PSA assembler and RELCVT are used). The GEN command automatically maps successive definitions of such names by replacing the trailing @ by A, B, C, etc. The same technique should be used for console, printer, and network drivers.

To allow various TurboDOS modules to be included or omitted at will, the GEN command automatically resolves all undefined external references to the default symbol ?UND?#. The TurboDOS common subroutine module COMSUB contains the following stub routine:

```
?UND?::  NOP           ;single- or double-length load
         NOP           ;of undefined returns zero
         XRA          A   ;call of undefined returns A=0
         RET           ;done
```

Thus, it is always safe to load or call an external name, whether or not it is defined.

Driver routines must preserve the stack and the index registers X and Y, but may use other registers as desired.

Initialization

All necessary hardware initialization and interrupt vector setup should be performed by an initialization routine that begins with the public entry name HDWNIT::. This routine is called by TurboDOS at system start-up with interrupts disabled. The hardware initialization procedure must not enable interrupts or make calls to WAIT# or DELAY#. In most cases, the HDWNIT:: routine should contain a series of calls to individual driver initialization subroutines. All initialization code which is not needed again should be assembled under the location counter (i.e., common block) ?INIT?.

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Implementation

Console Drivers

Each console driver routine should begin with the public entry name CONDR@::, and should perform a console operation in accordance with the operation code (0, 1, 2, 8 or 9) passed by TurboDOS in the E-register. A console number is passed in the B-register (obtained from the least-significant nibble of the console assignment table entry CONAST#).

If E=0, the driver must determine if a console input character is available. It must return with A=-1 if a character is available, or with A=0 if no character is available. If a character is available, the driver must return it in the C-register, but must not "consume" the character. (This look-ahead capability is used by TurboDOS to detect attention requests.)

If E=1, the driver must obtain a console input character (waiting for one if necessary), and return it in the A-register.

If E=2, the driver must output to the console the character passed by TurboDOS in the C-register.

If E=8, the driver should prepare to display a TurboDOS error message; if E=9, the driver should revert to normal display. Error message displays issued by TurboDOS are always preceded by an E=8 call and followed by an E=9 call. This gives the console driver the opportunity to take special action for system error messages (e.g., 25th line, reverse video). For simple console devices, the driver should perform a carriage-return and line-feed in response to E=8 and E=9 calls.

Printer Drivers

Each printer driver routine should begin with the public entry name LSTDR@::, and should perform a printer operation in accordance with the operation code (2 or 7) passed by TurboDOS in the E-register. A printer number is passed in the B-register (obtained from the least-significant nibble of the printer assignment table entry LSTAST#).

If E=2, the driver must output to the printer the character passed by TurboDOS in the C-register.

If E=7, the driver should take any appropriate end-of-print-job action (e.g., re-align forms, drop ribbon, home print head).

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Network Circuit Drivers

Each network circuit driver should begin with the public entry name CKTDR@:, and should send or receive a network message, according to the operation code (0 or 1) passed by TurboDOS in the C-register.

If C=0, the driver must receive a network message into the message buffer whose address is passed by TurboDOS in the DE-registers. If a message is received successfully, the driver must return with A=0. On the other hand, a malfunction of any remote processor is detected, the driver must return with A=-1 and must return the network address of the crashed processor in the DE-registers.

If C=1, the driver must send the network message from the message buffer whose address is passed by TurboDOS in the DE-registers. If a message is sent successfully, the driver must return with A=0. On the other hand, if the message could not be sent because of a malfunction of the destination processor, the driver must return with A=-1 and must return the network address of the crashed processor in the DE-registers.

The format of a network message buffer is:

Linkage:	.WORD	.	;buffer linkage
	.WORD	.	
Header:	.BYTE	MSGLEN	;message length (excludes linkage)
	.WORD	MSGDID	;network address of message destination
	.BYTE	MSGPID	;process ID
	.WORD	MSGSID	;network address of message source
	.WORD	MSGOID	;network address of originator
	.BYTE	MSGOPR	;process ID of originator
	.BYTE	MSGLVL	;forwarding level number
	.BYTE	MSGFCD	;message format code
Body:	.BLKB	7	;registers: A,C,B,E,D,L,H
	.BLKB	38	;FCB data and related info (optional)
	.BLKB	128	;record data (optional)

The first four bytes of a message buffer contains a linkage used by TurboDOS, and should not be sent or received by the driver. The eleven-byte header and variable-length body should be passed over the network. The driver should only need to look at the message length and destination ID in order to do its job. On a receive request (C=0), TurboDOS presets the message length byte to the maximum allowable message length, and expects that byte to contain the actual message length upon return. On a send request (C=1), TurboDOS presets the message length byte to the actual length

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

of the message to be sent (header plus body).

In simple master-slave network situations, it is often desirable for the circuit driver in the master processor to periodically "poll" the slave processors on its circuit in order to detect any slave malfunctions in a timely fashion and to effect recovery. If the circuit driver reports that a slave has crashed (by returning A=-1 and DE=net-address), then the circuit driver must not accept any further messages from that slave until TurboDOS has completed its recovery for that slave. TurboDOS signals the driver that such recovery is complete by sending a dummy message destined for that slave with a length of zero. The driver should not actually send such a message to the slave, but could initiate whatever action is appropriate to reset the slave and initiate a new down-load of the slave operating system.

For a slave processor to have its operating system downloaded over the network, it must send a special download-request message consisting of a standard eleven-byte header (with MSGPID, MSGOID and MSGFCD set to zero) followed by a one-byte body containing a "download suffix" character. The master processor specified by MSGDID will return a reply message whose body contains the first 128-byte record of the file OSSLAVEx.SYS (where "x" is the specified download suffix). The slave should continue to send download-request messages and receive successive records of the .SYS file until it receives a "short" reply message signifying end-of-file. The first word of the OSSLAVEx.SYS file specifies the base address to which the system should be moved, and the second word specifies the total length of the system. The single byte passed as the body of the "short" reply message identifies the system disk, and should be passed to the system in the A-register.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Disk Drivers

Each disk driver routine should begin with the public entry name DSKDR@::, and should perform a physical disk operation as specified by the physical disk request packet whose address is passed by TurboDOS in the X-register. The format of the physical disk request packet is:

X+0:	.BYTE	OPCODE	;disk operation code
X+1:	.BYTE	DRIVE	;drive number on controller (base 0)
X+2:	.WORD	TRACK	;physical track number (base 0)
X+4:	.WORD	SECTOR	;physical sector number (base 0)
X+6:	.WORD	SECCNT	;number of sectors to read or write
X+8:	.WORD	BYTCNT	;number of bytes to read or write
X+10:	.WORD	DMAADR	;DMA address for read or write
X+12:	.WORD	DSTADR	;disk specification table address
			;
			;copy of disk specification table follows
			;
X+14:	.BYTE	BLKSIZ	;block size (3=1K, 4=2K, ..., 7=16K)
X+15:	.WORD	NMBLKS	;number of blocks, total
X+17:	.BYTE	NMBDIR	;number of directory blocks
X+18:	.BYTE	SECSIZ	;sector size (0=128, 1=256, 2=512, ..., 7=16K)
X+19:	.WORD	SECTRK	;sectors per track
X+21:	.WORD	TRKDSK	;total tracks on disk
X+23:	.WORD	RESTRK	;reserved tracks on disk

If OPCODE=0, then the driver must read SECCNT physical sectors (or BYTCNT bytes) into DMAADR, starting at TRACK and SECTOR on DRIVE. Return with A=-1 if an unrecoverable error occurs, otherwise return with A=0. Although TurboDOS may request many consecutive sectors to be read, it will never request an operation which extends past the end of the specified track.

If OPCODE=1, then the driver must write SECCNT physical sectors (or BYTCNT bytes) from DMAADR, starting at TRACK and SECTOR on DRIVE. Return with A=-1 if an unrecoverable error occurs, otherwise return with A=0. Although TurboDOS may request many consecutive sectors to be written, it will never request an operation which extends past the end of the specified track.

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Implementation

If OPCODE=2, then the driver must determine the type of disk mounted in the specified drive, and must return in DSTADR the address of an 11-byte disk specification table structured as follows:

DST:	.BYTE	BLKSIZ	;block size (3=1K, 4=2K,..., 7=16K)
	.WORD	NMBLKS	;number of blocks, total
	.BYTE	NMBDIR	;number of directory blocks
	.BYTE	SECSIZ	;sector size (0=128, 1=256, 2=512,..., 7=16K)
	.WORD	SECTRK	;sectors per track
	.WORD	TRKDSK	;total tracks on disk
	.WORD	RESTRK	;reserved tracks on disk

On return, TurboDOS moves a copy of the disk specification table into X+14 through X+24, where it is available for subsequent read and write operations on that drive. If the drive is not ready or the type is unrecognizable, the driver must return A=0, otherwise it must return A=-1.

If OPCODE=3, then the driver must determine whether or not the specified drive is ready. Return A=-1 if the drive is ready, otherwise return A=0.

If OPCODE=4, then the driver must format (i.e., initialize) the specified TRACK on DRIVE. Hardware-dependent formatting information will be provided at DMAADR. Return with A=-1 if an unrecoverable error occurs, otherwise return with A=0.

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Real-Time Clock Driver

The real-time clock driver normally consists of an interrupt service routine which responds to interrupts from a periodic interrupt source (preferably 50 to 60 times per second). The interrupt service routine should call DLYTIC# once per system tick to synchronize process delay requests. It should also call RTCSEC# once per second (i.e., every 50 or 60 ticks) to update the system time and date. Finally, it should exit through ISRXIT# to provide a periodic system time-slice.

Excluding necessary initialization code, a typical real-time clock driver might look like this:

```
RTCCNT: .BYTE    1           ;divide-by-60 counter
;
RTCISR: SSPD     INTSP#      ;save user's stack pointer
        LXI     SP,INTSTK#  ;set up auxilliary stack
        PUSH   PSW         ;save all registers
        PUSH   B
        PUSH   D
        PUSH   H
        IN     STATUS      ;reset the interrupt condition
        CALL   DLYTIC#     ;signal one tick elapsed time
        LXI     H,RTCCNT   ;get divide-by-60 counter
        DCR    M           ;decrement counter
        JRNZ   ..X        ;not 60 ticks yet, exit
        MVI    M,60       ;else, reset counter to 60 ticks
        CALL   RTCSEC#     ;signal one second elapsed time
..X:    POP     H           ;restore all registers
        POP     D
        POP     B
        POP     PSW
        LSPD   INTSP#     ;restore user's stack pointer
        JMP    ISRXIT#    ;exit through dispatcher
```

If it is possible to determine the date and/or time-of-day at cold-start (e.g., by means of a battery-powered clock board), then the driver may initialize the following public symbols in RTCMGR:

```
SECS::  .BYTE    0           ;0..59
MINS::  .BYTE    0           ;0..59
HOURS:: .BYTE    0           ;0..23
JDATE:: .WORD    8001H      ;Julian date, based 31 Dec 47
```

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
System Implementation

Comm Channel Drivers

The comm channel driver supports the TurboDOS communications extensions (functions 87...93), and is not required if these functions are not used. The comm channel driver routine should begin with the public entry name COMDRV::, and should perform a comm channel operation in accordance with the operation code passed by TurboDOS in the E-register. A channel number is passed in the B-register.

If E=0, the driver must determine if an input character is available on the specified channel. It must return with A=-1 if a character is available, or with A=0 if no character is available.

If E=1, the driver must obtain an input character from the specified channel (waiting for one if necessary), and return it in the A-register.

If E=2, the driver must output to the specified channel the character passed by TurboDOS in the C-register.

If E=3, the driver must set the baud rate of the specified channel according to the baud rate code passed by TurboDOS in the C-register. (See function 90 in the User's Guide for definition of the codes.)

If E=4, the driver must obtain the current baud rate code for the specified channel, and return it in the A-register.

If E=5, the driver must set the modem controls of the specified channel according to the modem control vector passed by TurboDOS in the C-register. (See function 92 in the User's Guide for definition of the vector.)

If E=6, the driver must obtain the current modem status vector for the specified channel, and return it in the A-register. (See function 93 in the User's Guide for definition of the vector.)

Configuration Guide to TurboDOS 1.2

Copyright (C) 1982 by Software 2000, Inc.

System Implementation

Bootstrap ROM

Implementation of a TurboDOS bootstrap ROM involves linking the standard bootstrap module OSBOOT with a hardware-dependent driver OSBDRV. This should be accomplished with the GEN command, using the ";Lxxxx" option to establish the desired ROM base address. Since the OSBOOT module requires only 0.4K, the completed bootstrap can fit in a 1K ROM (e.g., 2708) if the driver is kept simple enough. The driver module OSBDRV must define five public entry names: INIT::, SELECT::, READ::, XFER::, and RAM::.

INIT:: is called at the beginning of the bootstrap process, and performs any required hardware initialization (e.g., of the disk controller). It must return with the load base address in the HL-registers. The load base address determines the RAM where loading of the file OSLOAD.COM will begin. It should normally be 0100H, but may have to be a higher address if low RAM cannot be written while the ROM is enabled.

SELECT:: selects the disk drive according to the drive number 0...15 passed in the A-register. If the selected drive is not ready or non-existent, then this routine must return A=0. Otherwise, it must return A=-1, and must return the address of an appropriate disk specification table in the HL-registers. The disk specification table is an 11-byte table whose format is the same as described earlier for the normal disk driver.

READ:: reads one physical sector from the last selected drive into RAM. On entry, the physical track is passed in the BC-registers, the physical sector is passed in the DE-registers, and the starting RAM address is passed in the HL-registers. The routine must return with A=0 if the operation was successful, or with A=-1 if an unrecoverable error occurred.

XFER:: is executed at the end of the bootstrap process, and transfers control to the loader program OSLOAD.COM which has been loaded into RAM. In most cases, this involves simply setting location 0080H to zero (to simulate a null command tail), and jumping to 0100H. However, if INIT returned a loader base other than 0100H, then XFER should move the loader program down to 0100H prior to execution.

RAM:: defines the beginning of a 64-byte area of RAM that OSBOOT can use as working storage. Obviously, it should not be located in the area in which OSLOAD.COM will be loaded!

Configuration Guide to TurboDOS 1.2
Copyright (C) 1982 by Software 2000, Inc.
Sample Driver Listings

APPENDIX — SAMPLE DRIVER LISTINGS

EQUATE - TURBODOS OPERATING SYSTEM --COMMON SYMBOLIC EQUATES FOR DRIVERS
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

;
; *****
;
; *
; * The following are common symbolic equates used in
; * the various drivers which follow. They are refer-
; * enced by a .INSERT DREQUATE in each driver module.
; *
; *****
;
; COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT EQUATE ;MODULE ID
;
; ASCII EQUIVALENCES
;
0000 ANUL == 00H ;NULL
0001 ASOH == 01H ;SOH
0002 ASTX == 02H ;STX
0003 AETX == 03H ;ETX
0004 AEOT == 04H ;EOT
0005 AENQ == 05H ;ENQ
0006 AACK == 06H ;ACK
0007 ABEL == 07H ;BELL
0008 ABS == 08H ;BS
0009 AHT == 09H ;HT
000A ALF == 0AH ;LF
000B AVT == 0BH ;VT
000C AFF == 0CH ;FF
000D ACR == 0DH ;CR
000E ASO == 0EH ;SO
000F ASI == 0FH ;SI
0010 ADLE == 10H ;DLE
0011 ADC1 == 11H ;DC1
0012 ADC2 == 12H ;DC2
0013 ADC3 == 13H ;DC3
0014 ADC4 == 14H ;DC4
0015 ANAK == 15H ;NAK
0016 ASYN == 16H ;SYN
0017 AETB == 17H ;ETB
0018 ACAN == 18H ;CAN
0019 AEM == 19H ;EM
001A ASUB == 1AH ;SUB
001B AESC == 1BH ;ESC
001C AFS == 1CH ;FS
001D AGS == 1DH ;GS
001E ARS == 1EH ;RS
001F AUS == 1FH ;US
0020 ASP == 20H ;SPACE
007F ARUB == 7FH ;RUBOUT (DEL)

```

EQUATE - TURBODOS OPERATING SYSTEM --COMMON SYMBOLIC EQUATES FOR DRIVERS
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

;
0000          WBOOT    == 0000H          ;WARM START ENTRYPOINT
0003          IOBYTE   == 0003H          ;I/O CONFIGURATION BYTE
0004          CURDRV   == 0004H          ;CURRENT DEFAULT DRIVE
0005          OPSYS    == 0005H          ;OPERATING SYSTEM ENTRYPOINT
005C          TFCB     == 005CH          ;DEFAULT FILE CONTROL BLOCK
0080          TBUF     == 0080H          ;DEFAULT DISK BUFFER ADDRESS
0100          TPA      == 0100H          ;TRANSIENT PROGRAM AREA BASE
;
0000          .LOC     0                  ;WORKING STORAGE RELATIVE TO 0
;
0000          PDRDP:    ;PD REQUEST DESCRIPTOR PACKET
0000          PDRFCN:  .BLKB  1          ;PD REQUEST FUNCTION NUMBER
0001          PDRDRV:  .BLKB  1          ;PD REQUEST DRIVE NUMBER
0002          PDRTRK:  .BLKW  1          ;PD REQUEST TRACK NUMBER
0004          PDRSEC:  .BLKW  1          ;PD REQUEST SECTOR NUMBER
0006          PDRSC:   .BLKW  1          ;PD REQUEST SECTOR COUNT
0008          PDRTC:   .BLKW  1          ;PD REQUEST TRANSFER COUNT
000A          PDRDMA:  .BLKW  1          ;PD REQUEST DMA ADDRESS
000C          PDRDST:  .BLKW  1          ;PD REQUEST DRIVE SPEC TABLE ADDR
000E          PDRLN   == .-PDRDP        ;PD REQUEST DESCRIPTOR PACKET LENG
;
000E          DSKNFO:  ;DISK TYPE INFORMATION
000E          BLKSIZ:  .BLKB  1          ;BLOCK SIZE
000F          NMBLKS:  .BLKW  1          ;NUMBER OF BLOCKS
0011          NMBDIR:  .BLKB  1          ;NUMBER OF DIRECTORY BLOCKS
0012          SECSIZ:  .BLKB  1          ;PHYSICAL SECTOR SIZE (2^N*128)
0013          SECTRK:  .BLKW  1          ;PHYSICAL SECTORS PER TRACK
0015          TRKDSK:  .BLKW  1          ;PHYSICAL TRACKS PER DISK
0017          RESTRK:  .BLKW  1          ;NUMBER OF RESERVED TRACKS
000B          DNFOL   == .-DSKNFO      ;DISK INFO LENGTH
;
.END

```

NITIMS - TURBODOS OPERATING SYSTEM HARDWARE INITIALIZATION (IMS)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This is the hardware initialization routine for
; * an IMS 8000 master processor. It consists only
; * of calls to the initialization entrypoints of
; * other driver modules.
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT NITIMS          ;MODULE ID
;
; INSERT DREQUATE      ;DRIVER SYMBOLIC EQUIVALENCES
;
0000:04          .LOC   .INIT.# ;LOCATE IN INITIALIZATION AREA
;
; HDWNIT::CALL MPENIT# ;INITIALIZE MEMORY PARITY
0000:04 CD 0000:05   CALL   SPINIT# ;INITIALIZE SERIAL/PARALLEL I/O
0003:04 CD 0000:06   CALL   RTCNIT# ;INITIALIZE REAL TIME CLOCK
0006:04 CD 0000:07   CALL   DSKINA# ;INITIALIZE DISK DRIVER A
0009:04 CD 0000:08   CALL   DSKINB# ;INITIALIZE DISK DRIVER B
000C:04 CD 0000:09   CALL   DSKINC# ;INITIALIZE DISK DRIVER C
000F:04 CD 0000:0A   CALL   DSKIND# ;INITIALIZE DISK DRIVER D
0012:04 CD 0000:0B   CALL   CKTINA# ;INITIALIZE CIRCUIT DRIVER A
0015:04 CD 0000:0C   CALL   CKTINB# ;INITIALIZE CIRCUIT DRIVER B
0018:04 CD 0000:0D   CALL   CKTINC# ;INITIALIZE CIRCUIT DRIVER C
001B:04 CD 0000:0E   CALL   CKTIND# ;INITIALIZE CIRCUIT DRIVER D
001E:04 C3 0000:0F   JMP    CKTIND# ;INITIALIZE CIRCUIT DRIVER D
;
; .END

```

MPENIT - TURBODOS OPERATING SYSTEM MEMORY PARITY INITIALIZATION
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This module initializes the parity of the RAM on
; * an IMS 64K RAM board or an IMS 740 slave proces-
; * sor board. The procedure is to do a 64K block
; * move of all memory which causes parity generation
; * to take place in all memory locations.
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; .IDENT MPENIT ;MODULE ID
;
; .INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
; .LOC .INIT.# ;LOCATE IN INITIALIZATION AREA
;
; MPENIT::LXI H,0 ;INITIALIZE MEMORY PARITY
;          LXI D,0
;          LXI B,0
;          LDIR
;          XRA A ;CLEAR START-UP PARITY ERROR
;          OUT 0
;          RET ;DONE
;
; .END
0000:04
0000:04 21 0000
0003:04 11 0000
0006:04 01 0000
0009:04 EDB0
000B:04 AF
000C:04 D300
000E:04 C9
    
```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
;
; * This is a disk driver for the IMS 401 eight-inch *
; * floppy disk controller board. This board makes *
; * use of a NEC uPD-765 floppy disk controller chip *
; * coupled with an Intel 8257 DMA controller chip. *
; *
; * This driver is fairly long and complex because: *
; *
; * (1) The NEC uPD-765 is not as easy to get along *
; * with as other chips (such as the Western *
; * Digital 1791 or 1793). *
; *
; * (2) The driver accomodates a wide variety of *
; * disk formats, including both TurboDOS non- *
; * interleaved and CP/M interleaved formats. *
; * The various formats are defined in a separate *
; * module DST8F. *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; .IDENT DSK401 ;MODULE ID
;
; .INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0082 CH1DMA = 82H ;CHANNEL 1 DMA REGISTER (FDC)
0083 CH1TC = 83H ;CHANNEL 1 TERMINAL COUNT (FDC)
0088 DMACTL = 88H ;DMA COMMAND AND STATUS REGISTERS
008A DSKSEL = 8AH ;DISK SELECT PORT
008C DSKCTL = 8CH ;STATUS AND INT MASK (BOARD)
008E FDCST = 8EH ;DISK CONTROLLER STATUS (uPD-765)
008F FDCDAT = 8FH ;DISK CONTROLLER DATA (uPD-765)
;
0042 CH1ENA = 42H ;DMA CHANNEL 1 ENABLE COMMAND
0000 DMAVfy = 00H ;DMA VERIFY COMMAND
0040 DMARD = 40H ;DMA READ COMMAND
0080 DMAWR = 80H ;DMA WRITE COMMAND
;
0003 FDCSFY = 03H ;FDC SPECIFY COMMAND
0004 FDCSDS = 04H ;FDC SENSE DRIVE STATUS COMMAND
0007 FDCRCL = 07H ;FDC RECALIBRATE COMMAND
0008 FDCSIS = 08H ;FDC SENSE INTERRUPT STATUS COMMAND
000A FDCRID = 0AH ;FDC READ ID COMMAND
000D FDCFMT = 0DH ;FDC FORMAT TRACK COMMAND
000F FDCSK = 0FH ;FDC SEEK COMMAND
0005 FDCWR = 05H ;FDC WRITE COMMAND
    
```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0006          FDCRD  = 06H          ;FDC READ COMMAND
;
0000          DSKENI = 0            ;DISK CONTROLLER ENABLE INTERRUPTS
0007          DSKDLC = 7            ;DISK CONTROLLER DELAY COMPLETE
;
0006          FDCMFM = 6            ;FDC DOUBLE-DENSITY BIT
0007          FDCMT  = 7            ;FDC MULTI-TRACK BIT
;
0004          FDCBSY = 4            ;FDC BUSY STATUS
0005          FDCSE  = 5            ;FDC SEEK END
0006          FDCOUT = 6            ;FDC OUTPUT MODE
0007          FDCRDY = 7            ;FDC READY FOR DATA
;
0003          SRT8Q  = 3            ;8 INCH FDD STEP RATE (3 MS-QUME)
0008          SRT8S  = 8            ;8 INCH FDD STEP RATE (8 MS-SHUG)
;
0024          HDLT   = 18*2        ;FDD HEAD LOAD TIME (36 MS)
0001          HDUT   = 1            ;FDD HEAD UNLOAD TIME (16 MS)
;
0003          STONR  = 3            ;STATUS REGISTER 0 NOT READY
0004          STOEC  = 4            ;STATUS REGISTER 0 EQUIP CHECK
0005          STOSE  = 5            ;STATUS REGISTER 0 SEEK END
;
0000          ST1MA  = 0            ;STATUS REGISTER 1 MISSING ADDR MK
0001          ST1NW  = 1            ;STATUS REGISTER 1 NOT WRITABLE
0002          ST1ND  = 2            ;STATUS REGISTER 1 NO DATA
0004          ST1OR  = 4            ;STATUS REGISTER 1 OVER RUN
0005          ST1DE  = 5            ;STATUS REGISTER 1 DATA ERROR
;
0003          ST3TS  = 3            ;STATUS REGISTER 3 TWO-SIDED
0004          ST3TO  = 4            ;STATUS REGISTER 3 TRACK 0
0005          ST3RDY = 5            ;STATUS REGISTER 3 READY
0006          ST3WP  = 6            ;STATUS REGISTER 3 WRITE PROTECTED
;
000A          MAXTRY = 10           ;MAX DISK TRY COUNT
;
0002          TSD    = 2            ;TWO-SIDED DISK BIT (TYPE CODE)
0003          DDD    = 3            ;DOUBLE DENSITY DISK BIT (TYPE COD)
;
0004          MINI   = 4            ;MINI-FLOPPY DISK BIT (TYPE CODE)
;
0000"         .LOC      .DATA.# ;LOCATE IN DATA AREA
;
0000" 08          SRT401: .BYTE SRT8S ;STEP RATE
0001" 00          TRYCNT: .BYTE 0     ;TRY COUNT
0002" 00          CALTBL: .BYTE 0     ;DRIVE CALIBRATED TABLE
0003" 00          FLAGS:  .BYTE 0     ;FLAGS
0004" 00          IORWC:  .BYTE 0     ;I/O READ/WRITE COMMAND
0005" 00          IODMAC: .BYTE 0     ;I/O DMA COMMAND
0006" 0000        RETSP:  .WORD 0     ;ERROR RETURN STACK POINTER
0008" 00          RIDDSK: .BYTE 0     ;READ ID DISK
0009" 00          CURSEC: .BYTE 0     ;CURRENT SECTOR NUMBER
000A" 0000        CURADR: .WORD 0     ;CURRENT DMA ADDRESS
000C" 00          CURSC:  .BYTE 0     ;CURRENT SECTOR COUNT

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

000D" 00 IOERR: .BYTE 0 ;I/O ERROR STATUS
;
000E" DMXSPH: ;MUTUAL EXCLUSION SEMAPHORE
000E" 0001 .WORD 1 ;SEMAPHORE COUNT
0010" 0010" ..DMXH: .WORD ..DMXH ;SEMAPHORE P/D HEAD
0012" 0010" .WORD ..DMXH
;
0014" DWTSPH: ;DISK WAIT SEMAPHORE
0014" 0000 .WORD 0 ;SEMAPHORE COUNT
0016" 0016" ..DWTH: .WORD ..DWTH ;SEMAPHORE P/D HEAD
0018" 0016" .WORD ..DWTH
;
001A" IDINFO: ;SECTOR ID INFO LIST
001A" 00 CYL: .BYTE 3 ;DISK CYLINDER NUMBER
001B" 00 HEAD: .BYTE 0 ;DISK HEAD NUMBER
001C" 00 REC: .BYTE 0 ;DISK RECORD NUMBER
001D" 00 SIZE: .BYTE 0 ;DISK SECTOR SIZE
001E" 00 EOT: .BYTE 0 ;END OF TRACK SECTOR NUMBER
001F" 00 GPL: .BYTE 0 ;DISK GAP 3 SIZE
0020" 00 DTL: .BYTE 0 ;DISK SECTOR SIZE WHEN SIZE=0
;
0021" RESULT: ;RESULT PHASE LIST
0021" 00 ST0: .BYTE 0 ;STATUS REGISTER 0
0022" 00 ST1: .BYTE 0 ;STATUS REGISTER 1
0023" 00 ST2: .BYTE 0 ;STATUS REGISTER 2
0024" 00 RCYL: .BYTE 0 ;DISK CYLINDER NUMBER
0025" 00 RHEAD: .BYTE 0 ;DISK HEAD NUMBER
0026" 00 RREC: .BYTE 0 ;DISK RECORD NUMBER
0027" 00 RSIZE: .BYTE 0 ;DISK SECTOR SIZE
0028" 00 MAINST: .BYTE 0 ;MAIN STATUS REGISTER
0029" 00 ST3: .BYTE 0 ;STATUS REGISTER 3
;
0000:04 .LOC .INIT.# ;LOCATE IN INITIALIZATION AREA
;
0000:04 DB8E DSKIN%::IN FDCST ;GET FDC STATUS
0002:04 3C INR A ;CONTROLLER PRESENT?
0003:04 C8 RZ ;IF NOT, DONE
0004:04 3EC3 MVI A,JMP ;ELSE, INITIALIZE INTERRUPT VECTOR
0006:04 32 0028 STA 5*8 ;(VECTORED INTERRUPT-5)
0009:04 21 0303' LXI H,DSKISR
000C:04 22 0029 SHLD (5*8)+1
000F:04 AF XRA A
0010:04 D388 OUT DMACTL ;DISABLE DMA CONTROLLER
0012:04 3E03 MVI A,FDCSFY ;GET FDC SPECIFY COMMAND
0014:04 CD 038E' CALL CMDRDY ;OUTPUT COMMAND TO FDC
0017:04 3A 0000" LDA SRT401 ;GET STEP RATE
001A:04 ED44 NEG ;CALC FDC STEP RATE VALUE
001C:04 C610 ADI 16
001E:04 87 ADD A
001F:04 87 ADD A
0020:04 87 ADD A
0021:04 87 ADD A
0022:04 F601 ORI HDUT ;COMBINE STEP RATE WITH HEAD UNLOA
0024:04 CD 0394' CALL DATOUT ;OUTPUT IT TO FDC

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0027:04 3E24          MVI     A,HDLT    ;GET HEAD LOAD TIME/NON-DMA BIT
0029:04 CD 0394'     CALL    DATOUT   ;OUTPUT IT TO FDC
002C:04 3E01          MVI     A,1<DSKENI
002E:04 D38C          OUT     DSKCTL   ;ENABLE CONTROLLER INTERRUPTS
0030:04 C9           RET           ;DONE

;
0000'          ;          .LOC      .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 21 000E"        DSKDR%::LXI     H,DMXSPH  ;GET MUTUAL EXCLUSION SEMAPHORE
0003' CD 0000:05     CALL    WAIT#   ;DISPATCH IF NECESSARY
0006' CD 0012'       CALL    ..DD    ;CALL DISK DRIVER
0009' F5             PUSH    PSW     ;SAVE RETURN CODE
000A' 21 000E"        LXI     H,DMXSPH ;GET MUTUAL EXCLUSION SEMAPHORE
000D' CD 0000:06     CALL    SIGNAL# ;SIGNAL PROCESS AS READY
0010' F1             POP     PSW     ;RESTORE RETURN CODE
0011' C9            RET           ;DONE

;
0012' ED73 0006"    ..DD:  SSPD    RETSP   ;SAVE ERROR RETURN STACK POINTER
0016' DD7E00        MOV     A,PDRFCN(X) ;GET PD REQ FUNCTION NUMBER
0019' B7            ORA    A       ;PD REQ FUNCTION NUMBER=0?
001A' 280F          JRZ    RDDSK  ;IF SO, CONTINUE
001C' 3D            DCR    A       ;PD REQ FUNCTION NUMBER=1?
001D' 281E          JRZ    WRDSK  ;IF SO, CONTINUE
001F' 3D            DCR    A       ;PD REQ FUNCTION NUMBER=2?
0020' CA 0206'     JZ     RETDST  ;IF SO, CONTINUE
0023' 3D            DCR    A       ;PD REQ FUNCTION NUMBER=3?
0024' CA 027F'     JZ     RETRDY  ;IF SO, CONTINUE
0027' 3D            DCR    A       ;PD REQ FUNCTION NUMBER=4?
0028' 282E          JRZ    FMTDSK ;IF SO, CONTINUE
002A' C9            RET           ;ELSE, DONE

;
002B' 3E0A          RDDSK: MVI     A,MAXTRY ;GET MAX TRY COUNT
002D' 32 0001"     STA    TRYCNT  ;SET TRY COUNT
0030' 3E06          ..RD:  MVI     A,FDCRD ;GET FDC READ COMMAND
0032' 0E40          MVI     C,DMARD ;GET DMA READ COMMAND
0034' CD 00C4'     CALL   DSKCOM  ;CALL COMMON CODE
0037' C8            RZ           ;NO ERRORS, RET A=0
0038' CD 011B'     CALL   RETRY   ;ERRORS, RECALIBRATE
003B' 18F3          JMPR   ..RD    ;TRY AGAIN

;
003D' 3E0A          WRDSK: MVI     A,MAXTRY ;GET MAX TRY COUNT
003F' 32 0001"     STA    TRYCNT  ;SET TRY COUNT
0042' 3E05          ..WR:  MVI     A,FDCWR ;GET FDC WRITE COMMAND
0044' 0E80          MVI     C,DMAWR ;GET DMA WRITE COMMAND
0046' CD 00C4'     CALL   DSKCOM  ;CALL COMMON CODE
0049' 2008          JRNZ   ..RT    ;IF ERRORS, RETRY
004B' 3E06          MVI     A,FDCRD ;ELSE, GET FDC READ COMMAND
004D' 0E00          MVI     C,DMAVfy ;GET DMA VERIFY COMMAND
004F' CD 00C4'     CALL   DSKCOM  ;CALL COMMON CODE
0052' C8            RZ           ;NO ERRORS, RET A=0
0053' CD 011B'     CALL   RETRY   ;ERRORS, RECALIBRATE
0056' 18EA          JMPR   ..WR    ;TRY AGAIN

;
0058' DD7E02        FMTDSK: MOV     A,PDRTRK(X) ;GET PD REQ TRACK NUMBER

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

005B'   B7           ORA      A           ;PD REQUEST TRACK NUMBER=0?
005C'   2006        JRNZ     ..NTRO   ;IF NOT, CONTINUE
005E'   CD 02CC'    CALL     SELCUR  ;ELSE, SELECT I/O DISK
0061'   CD 01CB'    CALL     RECAL   ;RECALIBRATE DRIVE
0064'   3E0A        ..NTRO: MVI     A,MAXTRY ;GET MAX TRY COUNT
0066'   32 0001"    STA     TRYCNT  ;SET TRY COUNT
0069'   CD 01A6'    ..FMT:  CALL    SEEK    ;SELECT DISK AND SEEK
006C'   3E80        MVI     A,DMAWR  ;GET DMA WRITE COMMAND
006E'   32 0005"    STA     IODMAC   ;SET DMA COMMAND
0071'   DD6E08      MOV     L,PDRTC(X) ;GET PD REQ TRANSFER COUNT
0074'   DD6609      MOV     H,PDRTC+1(X)
0077'   DD5E0A      MOV     E,PDRDMA(X) ;GET PD REQUEST DMA ADDRESS
007A'   DD560B      MOV     D,PDRDMA+1(X)
007D'   CD 013D'    CALL    DMANIT  ;INITIALIZE DMA CONTROLLER
0080'   3E0D        MVI     A,FDCFMT  ;GET FORMAT TRACK COMMAND
0082'   DDCB047E   BIT     7,PDRSEC(X) ;DOUBLE DENSITY FLAG SET?
0086'   2802        JRZ     ..SD    ;IF NOT, CONTINUE
0088'   CBF7        SET     FDCFMF,A  ;ELSE, SET DOUBLE DENSITY BIT
008A'   CD 038E'    ..SD:  CALL    CMDRDY  ;SEND FORMAT COMMAND TO FDC
008D'   DD7E01      MOV     A,PDRDRV(X) ;GET PD REQUEST DRIVE NUMBER
0090'   DDCB057E   BIT     7,PDRSEC+1(X) ;HEAD NUMBER ONE FLAG SET?
0094'   2802        JRZ     ..HDO   ;IF NOT, CONTINUE
0096'   CBD7        SET     2,A       ;ELSE, SET HEAD ONE BIT
0098'   CD 0394'    ..HDO:  CALL    DATOUT  ;OUTPUT UNIT NUMBER TO FDC
009B'   DD7E04      MOV     A,PDRSEC(X) ;GET PD REQUEST SECTOR (LSB)
009E'   E603        ANI     3         ;EXTRACT FORMAT SECTOR SIZE
00A0'   CD 0394'    CALL    DATOUT  ;OUTPUT FORMAT SECTOR SIZE TO FDC
00A3'   DD7E06      MOV     A,PDRSC(X) ;GET PD REQUEST SECTOR COUNT
00A6'   CD 0394'    CALL    DATOUT  ;OUTPUT SECTORS/TRACK TO FDC
00A9'   DD7E05      MOV     A,PDRSEC+1(X) ;GET PD REQUEST SECTOR (MSB)
00AC'   E67F        ANI     7FH       ;EXTRACT FORMAT GAP LENGTH
00AE'   CD 0394'    CALL    DATOUT  ;OUTPUT FORMAT GAP LENGTH TO FDC
00B1'   3EE5        MVI     A,OE5H   ;GET FORMAT FILLER BYTE
00B3'   CD 0394'    CALL    DATOUT  ;OUTPUT FORMAT FILLER BYTE TO FDC
00B6'   CD 02FC'    CALL    WTINT   ;WAIT FOR INTERRUPT
00B9'   3A 0021"    LDA     STO     ;GET STATUS REGISTER 0
00BC'   E6C0        ANI     0COH    ;ANY ERRORS?
00BE'   C8          RZ           ;NO ERRORS, RET A=0
00BF'   CD 011B'    CALL    RETRY  ;ERRORS, RECALIBRATE
00C2'   18A5        JMPR   ..FMT   ;TRY AGAIN

;
00C4'   32 0004"    DSKCOM: STA    IORWC  ;SET FDC READ/WRITE COMMAND
00C7'   79          MOV     A,C     ;GET DMA COMMAND
00C8'   32 0005"    STA    IODMAC  ;SET DMA COMMAND
00CB'   DD7E04      MOV     A,PDRSEC(X) ;GET PD REQ SECTOR NUMBER
00CE'   32 0009"    STA    CURSEC  ;SET CURRENT SECTOR
00D1'   DD6E0A      MOV     L,PDRDMA(X) ;GET PD REQUEST DMA ADDRESS
00D4'   DD660B      MOV     H,PDRDMA+1(X)
00D7'   22 000A"    SHLD  CURADR  ;SET CURRENT DMA ADDRESS
00DA'   DD7E06      MOV     A,PDRSC(X) ;GET PD REQ SECTOR COUNT
00DD'   32 000C"    STA    CURSC   ;SET CURRENT SECTOR COUNT
00E0'   CD 01A6'    CALL    SEEK    ;SELECT DISK AND SEEK
00E3'   AF          XRA     A
00E4'   32 000D"    STA    IOERR   ;CLEAR I/O ERROR STATUS

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

00E7'   CD 0155'   ..RWL:  CALL   SETID   ;SET UP SECTOR ID INFO
00EA'   CD 012B'   CALL   SETUP   ;SETUP READ/WRITE DMA
00ED'   CD 035D'   CALL   CMDOUT  ;SEND SECTOR ID INFO TO FDC
00F0'   CD 02FC'   CALL   WTINT   ;WAIT FOR INTERRUPT
00F3'   21 000D"  LXI    H,IOERR ;GET I/O ERROR STATUS
00F6'   3A 0021"  LDA    STO     ;GET STATUS REGISTER 0
00F9'   B6        ORA    M       ;ADD NEW STATUS
00FA'   77        MOV    M,A     ;UPDATE I/O ERROR STATUS
00FB'   CD 03CF'   CALL   GETXLT  ;GET TRANSLATION TABLE ADDRESS
00FE'   2815     JRZ    ..NI    ;IF TRANSLATION NOT REQUIRED, CONT
0100'   21 0009"  LXI    H,CURSEC ;ELSE, GET CURRENT SECTOR NUMBER
0103'   34        INR    M       ;INCREMENT CURRENT SECTOR
0104'   CD 03C4'   CALL   CALCSS  ;CALC SECTOR SIZE
0107'   EB        XCHG  ;SECTOR SIZE TO DE-REG
0108'   2A 000A"  LHLD  CURADR  ;GET CURRENT DMA ADDRESS
010B'   19        DAD    D       ;CALC NEXT DMA ADDRESS
010C'   22 000A"  SHLD  CURADR  ;UPDATE CURRENT DMA ADDRESS
010F'   21 000C"  LXI    H,CURSC ;GET CURRENT SECTOR COUNT
0112'   35        DCR    M       ;DECREMENT CURRENT SECTOR COUNT
0113'   20D2     JRNZ  ..RWL  ;IF TRANSFER NOT COMPLETE, CONTINU
0115'   3A 000D"  ..NI:  LDA    IOERR  ;GET I/O ERROR STATUS
0118'   E6C0     ANI    OCOH  ;EXTRACT COMPLETION STATUS
011A'   C9        RET    ;DONE

;
011B'   0E07     ;RETRY: MVI    C,ABEL  ;GET BELL CHARACTER
011D'   CD 0000:07 CALL  CONOUT# ;OUTPUT TO CONSOLE
0120'   CD 01CB'   CALL  RECAL   ;RECALIBRATE DRIVE
0123'   21 0001"  LXI    H,TRYCNT ;GET RETRY COUNT
0126'   35        DCR    M       ;DECREMENT RETRY COUNT
0127'   C0        RNZ    ;IF COUNT NOT EXHAUSTED, TRY AGAIN
0128'   C3 03EC'   JMP    FATAL  ;CONTINUE

;
012B'   CD 03CF'   SETUP:  CALL   GETXLT  ;GET TRANSLATION TABLE ADDRESS
012E'   DD6E08   MOV    L,PDRTC(X) ;GET PD REQ TRANSFER COUNT
0131'   DD6609   MOV    H,PDRTC+1(X)
0134'   2803     JRZ    ..NI    ;IF NO TRANSLATION RQRD, CONTINUE
0136'   CD 03C4'   CALL   CALCSS  ;ELSE, CALC SECTOR SIZE
0139'   ED5B 000A" ..NI:  LDED  CURADR  ;GET CURRENT DMA ADDRESS

;
013D'   AF        ;DMANIT: XRA    A
013E'   D388     OUT   DMACTL  ;RESET DMA CONTROLLER
0140'   2B        DCX    H       ;TERMINAL COUNT-1 FOR 8257
0141'   7D        MOV    A,L     ;GET LSB OF TERMINAL COUNT
0142'   D383     OUT   CH1TC  ;SEND LSB OF TERMINAL COUNT
0144'   3A 0005"  LDA    IODMAC  ;GET I/O DMA COMMAND
0147'   B4        ORA    H       ;ADD TO MSB OF TERMINAL COUNT
0148'   D383     OUT   CH1TC  ;SEND MSB OF TERMINAL COUNT
014A'   7B        MOV    A,E     ;GET LSB
014B'   D382     OUT   CH1DMA ;OUTPUT IT TO DMA CONTROLLER
014D'   7A        MOV    A,D     ;GET MSB
014E'   D382     OUT   CH1DMA ;OUTPUT IT TO DMA CONTROLLER
0150'   3E42     MVI    A,CH1ENA ;GET CHANNEL 1 ENABLE COMMAND
0152'   D388     OUT   DMACTL  ;ENABLE DMA CONTROLLER
0154'   C9        RET    ;DONE

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

;
0155' DD7E02      ;SETID: MOV     A,PDRTRK(X) ;GET PD REQ TRACK NUMBER
0158' 32 001A"   STA     CYL      ;SET CYLINDER
015B' 3A 0009"   LDA     CURSEC   ;GET CURRENT SECTOR
015E' 4F         MOV     C,A      ;SECTOR NUMBER TO C-REG
015F' CD 03CF'   CALL    GETXLT  ;GET TRANSLATION TABLE ADDRESS
0162' 2804      JRZ     ..NI    ;IF TRANSLATION NOT REQUIRED, CONT
0164' 0600      MVI     B,0     ;ELSE, MAKE SECTOR DOUBLE LENGTH
0166' 09        DAD     B      ;INDEX INTO TRANSLATION TABLE
0167' 4E        MOV     C,M     ;GET TRANSLATED SECTOR NUMBER
0168' 0C        ..NI:  INR     C      ;CONVERT SECTOR TO BASE 1
0169' DD4613    MOV     B,SECTRK(X) ;GET NUMBER OF SECTORS/TRACK
016C' CD 03DD'   CALL    GETTCA  ;GET DISK TYPE CODE ADDRESS
016F' CB56      BIT     TSD,M   ;TWO SIDED DISK?
0171' 2802      JRZ     ..SSD   ;IF NOT, CONTINUE
0173' CB38      SRLR    B      ;ELSE, CALC NUMBER OF SECTORS/SIDE
0175' 78        ..SSD: MOV     A,B     ;GET NUMBER OF SECTORS/SIDE
0176' 32 001E"   STA     EOT     ;SET END OF TRACK SECTOR NUMBER
0179' B9        CMP     C      ;FRONT SIDE OF DISK?
017A' 3E00      MVI     A,0     ;PRESET FOR FRONT SIDE
017C' 3005      JRNC    ..FS    ;IF FRONT SIDE, CONTINUE
017E' 79        MOV     A,C     ;GET SECTOR NUMBER
017F' 90        SUB     B      ;SUBTRACT ONE SIDES WORTH
0180' 4F        MOV     C,A     ;TO C-REG
0181' 3E01      MVI     A,1     ;GET HEAD #1
0183' 32 001B"   ..FS:  STA     HEAD    ;SET HEAD NUMBER
0186' 79        MOV     A,C     ;GET SECTOR NUMBER
0187' 32 001C"   STA     REC     ;SET RECORD NUMBER
018A' DD7E12    MOV     A,SECSIZ(X) ;GET SECTOR SIZE
018D' 32 001D"   STA     SIZE    ;SET RECORD SIZE
0190' B7        ORA     A      ;N=0?
0191' 3E80      MVI     A,128   ;PRESET DTL=128
0193' 2802      JRZ     ..NO    ;IF N=0, CONTINUE
0195' 3EFF      MVI     A,OFFH   ;ELSE, DTL=OFFH
0197' 32 0020"   ..NO:  STA     DTL     ;SET DATA LENGTH
019A' CD 03E5'   CALL    GETDST  ;GET DST ADDRESS
019D' 11 0000:08 LXI     D,GAPLEN# ;GET OFFSET TO GAP LENGTH
01A0' 19        DAD     D      ;CALC GAP LENGTH ADDRESS
01A1' 7E        MOV     A,M     ;GET GAP LENGTH
01A2' 32 001F"   STA     GPL     ;SET GAP LENGTH
01A5' C9        RET     ;DONE

;
01A6' CD 02CC'   ;SEEK:  CALL    SELCUR  ;SELECT I/O DISK
01A9' DD7E01    MOV     A,PDRDRV(X) ;GET PD REQ DISK NUMBER
01AC' 3C        INR     A      ;INCREMENT IT
01AD' 47        MOV     B,A     ;TO B-REG
01AE' AF        XRA     A      ;CLEAR DRIVE VECTOR
01AF' 37        STC     ;SET CARRY FLAG
01B0' 8F        ..SL:  ADC     A      ;SHIFT CARRY FLAG LEFT
01B1' 10FD     DJNZ    ..SL
01B3' 21 0002"   LXI     H,CALTB  ;GET DRIVE CALIBRATED TABLE
01B6' B6        ORA     M      ;COMBINE VECTOR W/CALIBRATED TABLE
01B7' BE        CMP     M      ;DRIVE ALREADY CALIBRATED?
01B8' 77        MOV     M,A     ;UPDATE DRIVE CALIBRATED TABLE
    
```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

01B9'   C4 01CB'   CNZ   RECAL   ;RE-CALIBRATE DRIVE, IF NECESSARY
01BC'   DD7E01    MOV   A,PDRDRV(X) ;GET PD REQ DISK NUMBER
01BF'   47        MOV   B,A        ;CONTROLLER DISK TO B-REG
01C0'   DD7E02    MOV   A,PDRTRK(X) ;GET PD REQ TRACK NUMBER
01C3'   4F        MOV   C,A        ;CYLINDER TO C-REG
01C4'   CD 01EA'  CALL  SEKCMD    ;SEND SEEK COMMAND
01C7'   C8        RZ     ;IF NO ERRORS, DONE
01C8'   C3 03EC'  JMP   FATAL     ;CONTINUE

;
01CB'   DD7E01    ;RECAL: MOV   A,PDRDRV(X) ;GET PD REQ DISK NUMBER
01CE'   CD 01D5'  CALL  RECCMD    ;SEND RECALIBRATE COMMAND
01D1'   C8        RZ     ;IF NO ERRORS, DONE
01D2'   C3 03EC'  JMP   FATAL     ;CONTINUE

;
01D5'   F5        ;RECCMD: PUSH  PSW     ;SAVE CONTROLLER DISK
01D6'   3E07      MVI   A,FDCRCL  ;GET FDC RECALIBRATE COMMAND
01D8'   CD 038E'  CALL  CMDRDY    ;OUTPUT COMMAND TO FDC
01DB'   F1        POP   PSW     ;RESTORE CONTROLLER DISK
01DC'   CD 0394'  CALL  DATOUT    ;OUTPUT IT TO FDC
01DF'   CD 02FC'  CALL  WTINT     ;WAIT FOR INTERRUPT
01E2'   3A 0021" LDA   STO       ;GET STATUS REGISTER 0
01E5'   E6E0      ANI   OCOH1<FDCSE ;EXTRACT COMPLETION STATUS
01E7'   FE20      CPI   1<FDCSE  ;ANY ERRORS?
01E9'   C9        RET     ;DONE

;
01EA'   C5        ;SEKCMD: PUSH  B       ;SAVE DISK/TRACK
01EB'   3E0F      MVI   A,FDCSK   ;GET FDC SEEK COMMAND
01ED'   CD 038E'  CALL  CMDRDY    ;OUTPUT COMMAND TO FDC
01F0'   C1        POP   B       ;RESTORE DISK/TRACK
01F1'   C5        PUSH  B       ;SAVE DISK/TRACK
01F2'   78        MOV   A,B       ;GET CONTROLLER DISK
01F3'   CD 0394'  CALL  DATOUT    ;OUTPUT IT TO FDC
01F6'   C1        POP   B       ;RESTORE DISK/TRACK
01F7'   79        MOV   A,C       ;GET CYLINDER NUMBER
01F8'   CD 0394'  CALL  DATOUT    ;OUTPUT IT TO FDC
01FB'   CD 02FC'  CALL  WTINT     ;WAIT FOR INTERRUPT
01FE'   3A 0021" LDA   STO       ;GET STATUS REGISTER 0
0201'   E6E0      ANI   OCOH1<FDCSE ;EXTRACT COMPLETION STATUS
0203'   FE20      CPI   1<FDCSE  ;ANY ERRORS?
0205'   C9        RET     ;DONE

;
0206'   CD 027F'  ;RETDST: CALL  RETRDY  ;RETURN READY STATUS
0209'   B7        ORA   A       ;DRIVE READY?
020A'   C8        RZ     ;IF NOT, DONE
020B'   0E00      MVI   C,0      ;ELSE, GET INITIAL TYPE VALUE
020D'   3A 0029" LDA   ST3     ;GET STATUS REGISTER 3
0210'   CB5F      BIT   ST3TS,A ;ONE-SIDED DISK?
0212'   2802      JRZ   ..OS    ;YES
0214'   CBD1      SET  TSD,C    ;SET TWO-SIDED DISK BIT
0216'   DD7E01    ;..OS: MOV   A,PDRDRV(X) ;GET PD REQ DISK NUMBER
0219'   32 0008" STA  RIDDSK  ;SET READ ID DISK
021C'   CD 026A'  CALL  ..FD    ;FIND DISK DENSITY
021F'   280F      JRZ   ..DF    ;IF DENSITY FOUND, CONTINUE
0221'   C5        PUSH  B       ;ELSE, SAVE DISK TYPE CODE

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0222'   DD7E01           MOV     A,PDRDRV(X) ;GET PD REQ DISK NUMBER
0225'   CD 01D5'       CALL    RECCMD ;RECALIBRATE DRIVE
0228'   C1              POP     B ;RESTORE DISK TYPE CODE
0229'   2032           JRNZ    ..NR ;IF UNABLE TO RECALIBRATE, CONTINU
022B'   CD 026A'       CALL    ..FD ;ELSE, ATTEMPT TO FIND DISK DENSIT
022E'   202D           JRNZ    ..NR ;IF DENSITY NOT FOUND, CONTINUE
0230'   B1              ..DF:  ORA     C ;ADD SECTOR SIZE TO TYPE CODE
0231'   4F              MOV     C,A
0232'   CB51           BIT     TSD,C ;TWO SIDED BIT SET?
0234'   2814           JRZ     ..FDI ;IF NOT, CONTINUE
0236'   21 0008"       LXI     H,RIDDSK ;GET READ ID DISK
0239'   CBD6           SET     2,M ;SET HEAD BIT
023B'   3E4A           MVI     A,FDCRID!1<FDCMFM ;GET READ ID CMD (DD)
023D'   CB59           BIT     DDD,C ;DOUBLE DENSITY BIT SET?
023F'   2002           JRNZ    ..DD ;IF SO, CONTINUE
0241'   CBB7           RES     FDCMFM,A ;ELSE, RESET MFM BIT
0243'   CD 0279'       ..DD:  CALL    ..RID ;ATTEMPT TO READ ID ON BACK SIDE
0246'   2802           JRZ     ..FDI ;IF READABLE, CONTINUE
0248'   CB91           RES     TSD,C ;ELSE, RESET TWO SIDED BIT
024A'   11 0000:09     ..FDI:  LXI     D,DSTBLS# ;GET DISK SPEC TABLES
024D'   79              ..SL2:  MOV     A,C ;GET DISK TYPE CODE
024E'   21 0000:0A     LXI     H,DTCO# ;GET OFFSET TO DISK TYPE CODE
0251'   19              DAD     D ;CALC DISK TYPE CODE ADDRESS
0252'   BE              CMP     M ;DISK SPEC TABLE FOUND?
0253'   280A           JRZ     ..DSTF ;IF SO, CONTINUE
0255'   EB              XCHG   ;DISK SPEC TABLE ADDRESS TO HL-REG
0256'   5E              MOV     E,M ;GET DISK SPEC TABLE LINK POINTER
0257'   23              INX     H
0258'   56              MOV     D,M
0259'   7A              MOV     A,D
025A'   B3              ORA     E ;END OF LIST?
025B'   20F0           JRNZ    ..SL2 ;IF NOT, CONTINUE
025D'   AF              ..NR:  XRA     A ;ELSE, SET RETURN CODE=0
025E'   C9              RET     ;DONE
025F'   13              ..DSTF: INX     D ;ADVANCE PAST LINK POINTER
0260'   13              INX     D
0261'   DD730C         MOV     PDRDST(X),E ;SET DISK SPEC TABLE ADDRESS
0264'   DD720D         MOV     PDRDST+1(X),D
0267'   3EFF           MVI     A,OFFH ;SET RETURN CODE=OFFH
0269'   C9              RET     ;DONE
026A'   3E0A           ..FD:  MVI     A,FDCRID ;GET FDC READ ID COMMAND (SD)
026C'   CD 0279'       CALL    ..RID ;ATTEMPT TO READ SINGLE-DENSITY
026F'   C8              RZ     ;IF SINGLE-DENSITY, DONE
0270'   3E4A           MVI     A,FDCRID!1<FDCMFM ;GET READ ID CMD (DD)
0272'   CD 0279'       CALL    ..RID ;ATTEMPT TO READ DOUBLE-DENSITY
0275'   C0              RNZ    ;IF UNABLE, DONE
0276'   CBD9           SET     DDD,C ;SET DOUBLE-DENSITY DISK BIT
0278'   C9              RET     ;DONE
0279'   C5              ..RID:  PUSH    B ;SAVE BC
027A'   CD 02A2'       CALL    READID ;READ DISK ID
027D'   C1              POP     B ;RESTORE BC
027E'   C9              RET     ;DONE
027F'   DD7E01           ;
RETRDY: MOV     A,PDRDRV(X) ;GET PD REQ DISK NUMBER

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0282' FE04          CPI      4          ;TEST FOR VALID DRIVE NUMBER
0284' 3E00          MVI      A,0        ;PRESET RETURN CODE=0
0286' D0           RNC          ;IF INVALID DRIVE, RETURN NOT READ
0287' DB8E          IN        FDCST     ;GET FDC STATUS
0289' 3C           INR        A         ;CONTROLLER PRESENT?
028A' C8           RZ          ;IF NOT, DONE
028B' CD 02CC'     CALL     SELCUR   ;ELSE, SELECT REQUESTED DRIVE
028E' CD 0298'     CALL     ..RDY    ;CHECK IF DRIVE READY
0291' C0           RNZ          ;IF SO, DONE
0292' 21 0001      LXI      H,1        ;ELSE, DELAY ONE TICK...
0295' CD 0000:0B  CALL     DELAY#    ;...SO 765 CAN SCAN
0298' CD 02E9'     ..RDY: CALL     SENSDDS  ;SENSE DRIVE STATUS
029B' CB6F         BIT      ST3RDY,A   ;DRIVE READY?
029D' 3E00          MVI      A,0        ;PRESET RETURN CODE=0
029F' C8           RZ          ;IF DRIVE NOT READY, DONE
02A0' 2F          CMA          ;ELSE, SET RETURN CODE=OFFH
02A1' C9           RET          ;DONE

;
02A2' CD 038E'     ;READID: CALL    CMDRDY   ;OUTPUT COMMAND TO FDC
02A5' 3A 0008"    LDA      RIDDSK   ;GET READ ID DISK
02A8' CD 0394'     CALL    DATOUT   ;OUTPUT IT TO FDC
02AB' CD 02FC'     CALL    WTINT    ;WAIT FOR INTERRUPT
02AE' 3A 0021"    LDA      STO       ;GET STATUS REGISTER 0
02B1' E6C0        ANI      OCOH    ;EXTRACT COMPLETION STATUS
02B3' 3A 0027"    LDA      RSIZE   ;RETURN SECTOR SIZE
02B6' C9         RET          ;DINE

;
02B7'             DLCPOL:          ;DELAY COMPLETE POLL ROUTINE
02B7' 0000        .WORD    0
02B9' 0000        .WORD    0

;
02BB' DB8C        ;DLCPR: IN      DSKCTL   ;GET DISK CONTROLLER STATUS
02BD' CB7F        BIT      DSKDLC,A   ;DELAY COMPLETE (MOTORS RUNNING)
02BF' C8         RZ          ;IF NOT, DONE
02C0' 21 02B7'    LXI      H,DLCPOL   ;ELSE, GET POLL ROUTINE
02C3' CD 0000:0C CALL    UNLINK#  ;UNLINK POLL ROUTINE FROM POLL LIS
02C6' 21 0014"    LXI      H,DWTSPH   ;GET DISK WAIT SEMAPHORE
02C9' C3 0000:06 JMP     SIGNAL#  ;CONTINUE

;
02CC' DB8C        ;SELCUR: IN      DSKCTL   ;GET DISK CONTROLLER STATUS
02CE' 0F         RRC          ;EXTRACT SELECTED DRIVE
02CF' E603        ANI      3
02D1' 4F         MOV      C,A        ;TO C-REG
02D2' DD7E01     MOV      A,PDRDRV(X) ;GET PD REQ DISK NUMBER
02D5' B9         CMP      C         ;DRIVE ALREADY SELECTED?
02D6' 2802        JRZ      ..DAS    ;IF SO, CONTINUE
02D8' D38A        OUT      DSKSEL   ;ELSE, SELECT CONTROLLER DISK
02DA' 11 02B7'    ..DAS: LXI      D,DLCPOL   ;GET POLL ROUTINE
02DD' CD 0000:0D CALL    LNKPOL#  ;CREATE POLL ROUTINE
02E0' CD 02BB'    CALL    DLCPR   ;EXECUTE POLL ROUTINE
02E3' 21 0014"    LXI      H,DWTSPH   ;GET DISK WAIT SEMAPHORE
02E6' C3 0000:05 JMP     WAIT#    ;DISPATCH IF NECESSARY

;
02E9' 3E04        SENSDDS: MVI     A,FDCSDS ;GET FDC SENSE DRIVE STATUS CMD

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

02EB'   CD 038E'           CALL   CMDRDY ;OUTPUT COMMAND TO FDC
02EE'   DD7E01           MOV    A,PDRDRV(X) ;GET PD REQ DISK NUMBER
02F1'   CD 0394'           CALL   DATOUT ;OUTPUT IT TO FDC
02F4'   CD 039B'           CALL   DATAIN ;GET STATUS REGISTER 3
02F7'   32 0029"          STA    ST3 ;SAVE STATUS REGISTER 3
02FA'   FB                EI        ;ENABLE INTERRUPTS
02FB'   C9                RET       ;DONE

02FC'   FB                ;
                                ;
                                ;
02FD'   21 0014"          ;WTINT: EI ;ENABLE INTERRUPTS
0300'   C3 0000:05        LXI    H,DWTSPH ;GET DISK WAIT SEMAPHORE
                                ;
                                ;
                                ;
                                ;
0303'   ED73 0000:0E      ;DSKISR: SSPD INTSP# ;SAVE INTERRUPT STACK PCINTER
0307'   31 0000:0F        LXI    SP,INTSTK# ;SET UP AUX STACK
030A'   F5                PUSH   PSW ;SAVE REGISTERS
030B'   C5                PUSH   B
030C'   D5                PUSH   D
030D'   E5                PUSH   H
030E'   DB8E              ;..RQML: IN FDCST ;GET FDC STATUS
0310'   CB7F              BIT    FDCRDY,A ;FDC READY FOR CONVERSATION?
0312'   28FA              JRZ    ;..RQML ;IF NOT, WAIT
0314'   32 0028"          STA    MAINST ;SAVE MAIN STATUS REGISTER
0317'   CB77              BIT    FDCOUT,A ;FDC IN OUTPUT MODE?
0319'   2020              JRNZ   ;..RW ;IF SO, PROCESS
031B'   3E08              MVI    A,FDCSIS ;GET SENSE INTERRUPT STATUS CMD
031D'   D38F              OUT   FDCDAT ;OUTPUT IT TO FDC DATA REGISTER
031F'   CD 039B'           CALL   DATAIN ;GET STATUS REGISTER 0
0322'   4F                MOV    C,A ;SAVE IT IN C-REG
0323'   E6C0              ANI    OCOH ;EXTRACT COMPLETION STATUS
0325'   FE80              CPI    80H ;INTERRUPT STACK EMPTY?
0327'   2829              JRZ    ;..X ;IF SO, DONE
0329'   CD 039B'           CALL   DATAIN ;GET PRESENT CYLINDER NUMBER
032C'   CB69              BIT    STOSE,C ;READY LINE CHANGE STATE?
032E'   28DE              JRZ    ;..RQML ;IF SO, IGNORE
0330'   32 0024"          STA    RCYL ;ELSE, SAVE PCN
0333'   79                MOV    A,C ;GET STATUS REGISTER 0
0334'   32 0021"          STA    STO ;SAVE IT
0337'   3E01              MVI    A,1 ;SET INTERRUPT COMPLETION STATUS
0339'   180F              JMPR   ;..SIGC ;CONTINUE
033B'   21 0021"          ;..RW: LXI H,RESULT ;GET RESULT TABLE
033E'   0607              MVI B,7 ;GET LENGTH OF RESULT PHASE
0340'   CD 039B'           ;..RL: CALL DATAIN ;GET RESULT BYTE FROM FDC
0343'   77                MOV M,A ;STORE IN RESULT AREA
0344'   23                INX H ;INCREMENT POINTER
0345'   10F9              DJNZ ;..RL ;READ ALL SEVEN BYTES
0347'   AF                XRA A
0348'   D388              OUT DMACTL ;DISABLE DMA CONTROLLER
034A'   21 0014"          ;..SIGC: LXI H,DWTSPH ;GET DISK WAIT SEMAPHORE
034D'   CD 0000:06        CALL SIGNAL# ;SIGNAL PROCESS AS READY
0350'   18BC              JMPR   ;..RQML ;FLUSH ANY REMAINING INTERRUPTS
0352'   E1                ;..X: POP H ;REGISTERS
0353'   D1                POP D
0354'   C1                POP B
0355'   F1                POP PSW

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0356' ED7B 0000:0E      LSPD      INTSP# ;RESTORE STACK POINTER
035A' C3 0000:10      JMP       ISRXIT# ;CONTINUE
;
035D' CD 03DD'      CMDOUT: CALL GETTCA ;GET DISK TYPE CODE ADDRESS
0360' 3A 0004"      LDA      IORWC  ;GET READ/WRITE COMMAND
0363' CB5E          BIT      DDD,M  ;DOUBLE DENSITY DISK?
0365' 2802          JRZ     ..SD  ;IF NOT, SINGLE DENSITY
0367' CBF7          SET     FDCMFM,A ;ELSE, SET DOUBLE DENSITY BIT
0369' CB56          ..SD: BIT     TSD,M  ;TWO-SIDED DISK?
036B' 2802          JRZ     ..SS  ;IF NOT, SINGLE SIDED
036D' CBF7          SET     FDCMT,A ;ELSE, SET MULTI-TRACK BIT
036F' CD 038E'      ..SS: CALL  CMDRDY ;SEND COMMAND TO FDC
0372' DD7E01      MOV     A,PDRDRV(X) ;GET PD REQ DISK NUMBER
0375' 21 001B"     LXI     H,HEAD ;GET HEAD NUMBER
0378' CB46          BIT     0,M   ;HEAD #0?
037A' 2802          JRZ     ..FS  ;IF SO, CONTINUE
037C' CBD7          SET     2,A   ;ELSE, SET HEAD #1 BIT IN I/O DISK
037E' CD 0394'      ..FS: CALL  DATOUT ;OUTPUT IT TO FDC
0381' 21 001A"     LXI     H,IDINFO ;GET SECTOR ID INFO
0384' 0607          MVI     B,7   ;B=LENGTH OF ID INFO
0386' 7E          ..IDL: MOV     A,M   ;GET BYTE FROM LIST
0387' 23          INX     H   ;INCREMENT POINTER
0388' CD 0394'      CALL  DATOUT ;OUTPUT BYTE TO FDC
038B' 10F9          DJNZ   ..IDL  ;SEND ENTIRE LIST
038D' C9          RET     ;DONE
;
038E' CD 03A6'      CMDRDY: CALL  OUTRDY ;WAIT FOR FDC READY
0391' F3          DI      ;DISABLE INTERRUPTS
0392' 1803          JMPR   OUTCOM ;JOIN COMMON CODE
;
0394' CD 03A6'      DATOUT: CALL  OUTRDY ;WAIT FOR FDC READY
;
0397' 79          OUTCOM: MOV     A,C   ;RESTORE OUTPUT BUTE
0398' D38F          OUT    FDCDAT ;OUTPUT BYTE TO FDC DATA REGISTER
039A' C9          RET     ;DONE
;
039B' DB8E          DATAIN: IN     FDCST  ;GET FDC STATUS
039D' 07          RLC     ;TEST FDC FOR READY
039E' 30FB          JRNC   DATAIN ;IF NOT READY, WAIT
03A0' 07          RLC     ;TEST FDC DIRECTION
03A1' 300B          JRNC   FDCERR  ;IF WRONG DIRECTION, DIAGNOSE
03A3' DB8F          IN     FDCDAT  ;GET FDC DATA BYTE
03A5' C9          RET     ;DONE
;
03A6' 4F          OUTRDY: MOV     C,A   ;SAVE OUTPUT BYTE
03A7' DB8E          ..RW: IN     FDCST  ;GET FDC STATUS
03A9' 07          RLC     ;TEST FDC FOR READY
03AA' 30FB          JRNC   ..RW   ;IF NOT READY, WAIT
03AC' 07          RLC     ;TEST FDC DIRECTION
03AD' DO          RNC     ;IF DIRECTION CORRECT, DONE
;
03AE' CD 0000:11     FDCERR: CALL  DMS#   ;SOUND BELL
03B1' 87          .ASCIS [ABEL]
03B2' CD 0000:12     CALL  CONSO# ;SHIFT CONSOLE TO ERROR LINE

```

DSK401 - TURBODOS OPERATING SYSTEM IMS 8-INCH FLOPPY DISK DRIVER
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

03B5'   CD 0000:11           CALL   DMS#       ;DISPLAY ERROR MESSAGE
03B8'   464443204572       .ASCIS "FDC Error"
03C1'   C3 03C1'           JMP     .         ;HALT

;
03C4'   21 0080           ;CALCSS: LXI   H,128   ;GET 128 BYTE SECTOR LENGTH
03C7'   DD7E12           MOV    A,SECSIZ(X) ;GET SECTOR SIZE
03CA'   3D                ;..SL:  DCR    A       ;DECREMENT SECTOR SIZE
03CB'   F8                RM     ;IF UNDERFLOW, DONE
03CC'   29                DAD   H         ;ELSE, SHIFT SECTOR SIZE LEFT
03CD'   18FB             JMPR  ..SL      ;CONTINUE

;
03CF'   CD 03E5'         ;GETXLT: CALL  GETDST ;GET DST ADDRESS
03D2'   11 0000:13       LXI   D,XLTBL#  ;GET OFFSET TO TRANSLATION TABLE
03D5'   19                DAD   D         ;CALC TRANSLATION TABLE ADDRESS
03D6'   5E                MOV   E,M      ;GET TRANSLATION TABLE ADDRESS
03D7'   23                INX   H
03D8'   56                MOV   D,M
03D9'   EB                XCHG          ;TRANSLATION TABLE ADDRESS TO HL-R

03DA'   7C                MOV   A,H
03DB'   B5                ORA   L         ;TRANSLATION REQUIRED?
03DC'   C9                RET           ;DONE

;
03DD'   CD 03E5'         ;GETTCA: CALL  GETDST ;GET DST ADDRESS
03E0'   11 0000:14       LXI   D,TYP COD# ;GET OFFSET TO DISK TYPE CODE
03E3'   19                DAD   D         ;CALC DISK TYPE CODE ADDRESS
03E4'   C9                RET           ;DONE

;
03E5'   DD6E0C           ;GETDST: MOV   L,PDRDST(X) ;GET PD REQUEST DST ADDRESS
03E8'   DD660D           MOV   H,PDRDST+1(X)
03EB'   C9                RET           ;DONE

;
03EC'   ED7B 0006"       ;FATAL: LSPD   RETSP  ;RESTORE STACK POINTER
03F0'   3EFF             MVI   A,OFFH   ;RETURN ERROR CODE
03F2'   C9                RET           ;DONE

;
.END

```

DSKFMT - TURBODOS OPERATING SYSTEM 8-INCH FLOPPY DISK SPECIFICATION TABLES
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This is a list of disk specification tables for
; * all of the 8-inch floppy disk formats supported
; * by the DSK401 disk driver module and the MPB401
; * boot prom driver module.
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT DSKFMT ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
0002 TSD = 2 ;TWO-SIDED DISK BIT (TYPE CODE)
0003 DDD = 3 ;DOUBLE DENSITY DISK BIT (TYPE COD
;
;
; .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
; 1024 BYTE SECTOR, DOUBLE-DENSITY, TWO-SIDED
;
; DSTBLS::.WORD .+DSTL ;DISK SPEC TABLE LINK POINTER
0000' 0011' .BYTE 4 ;BLOCK SIZE
0002' 04 .WORD (77*(16*(1<3)))/(1<4) ;NUMBER OF BLOCKS
0003' 0268 .BYTE 4 ;NUMBER OF DIRECTORY BLOCKS
0005' 04 .BYTE 3 ;PHYSICAL SECTOR SIZE (2^N*128)
0006' 03 .WORD 16 ;PHYSICAL SECTORS PER TRACK
0007' 0010 .WORD 77 ;PHYSICAL TRACKS PER DISK
0009' 004D .WORD 0 ;NUMBER OF RESERVED TRACKS
000B' 0000 .WORD 0 ;TRANSLATION TABLE ADDRESS
000D' 0000 .BYTE 1<DDD!1<TSD!3 ;DISK TYPE CODE
000F' 0F .BYTE 35H ;GAP LENGTH
0010' 35
;
;
; 1024 BYTE SECTOR, DOUBLE-DENSITY, ONE-SIDED
;
; .WORD .+DSTL ;DISK SPEC TABLE LINK POINTER
0011' 0022' .BYTE 4 ;BLOCK SIZE
0013' 04 .WORD (77*(8*(1<3)))/(1<4) ;NUMBER OF BLOCKS
0014' 0134 .BYTE 3 ;NUMBER OF DIRECTORY BLOCKS
0016' 03 .BYTE 3 ;PHYSICAL SECTOR SIZE (2^N*128)
0017' 03 .WORD 8 ;PHYSICAL SECTORS PER TRACK
0018' 0008 .WORD 77 ;PHYSICAL TRACKS PER DISK
001A' 004D .WORD 0 ;RESERVED TRACKS
001C' 0000 .WORD 0 ;TRANSLATION TABLE ADDRESS
001E' 0000 .BYTE 1<DDD!3 ;DISK TYPE CODE
0020' 0B .BYTE 35H ;GAP LENGTH
0021' 35
    
```


DSKFMT - TURBODOS OPERATING SYSTEM 8-INCH FLOPPY DISK SPECIFICATION TABLES
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

;
; SINGLE-DENSITY/SINGLE-SIDED SECTOR TRANSLATION TABLE
;
0055' 00060C121804 TRTBL: .BYTE 0,6,12,18,24,4,10,16,22
005E' 02080E140107      .BYTE 2,8,14,20,1,7,13,19,25
0067' 050B11170309      .BYTE 5,11,17,23,3,9,15,21
;
.END
```

CON192 - TURBODOS OPERATING SYSTEM 19.2KB CONSOLE DRIVER
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This is a trivial console driver for a 19.2KB
; * console device connected to serial channel zero.
; * This module is hardware-independent. All access
; * to the serial interface hardware is accomplished
; * via calls to the entrypoint SERIAL:: in the hard-
; * ware dependent serial driver modules SPD442 or
; * SPD740.
; *
; *****
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
; VERSION: EXAMPLE
; IDENT CON192 ;MODULE ID
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0000" .LOC .DATA.# ;LOCATE IN DATA AREA
;
0000" 8F CONBR:: .BYTE 8FH ;CONSOLE BAUD RATE CODE (19200 BAU
0001" 0C FFCHR:: .BYTE AFF ;FORM FEED CHARACTER
0002" 00 INITC: .BYTE 0 ;INITIALIZATION COMPLETE FLAG
;
0000' .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 21 0002" CONDR%::LXI H,INITC ;GET INITIALIZATION COMPLETE FLAG
0003' 7E MOV A,M
0004' B7 ORA A ;INITIALIZATION COMPLETE FLAG SET?
0005' CC 0013' CZ ..INIT ;IF NOT, INITIALIZE CONSOLE BAUD R
E
0008' 7B ..CDRV: MOV A,E ;GET FUNCTION NUMBER
0009' D608 SUI 8 ;FUNCTION NUMBER=8?
000B' 2823 JRZ CONSO ;IF SO, ERROR SHIFT OUT
000D' 3D DCR A ;FUNCTION NUMBER=9?
000E' 2820 JRZ CONSI ;IF SO, ERROR SHIFT IN
0010' C3 0000:04 JMP SERIAL# ;ELSE, CONTINUE
0013' 35 ..INIT: DCR M ;SET INITIALIZATION COMPLETE FLAG
0014' D5 PUSH D ;SAVE FUNCTION NUMBER
0015' C5 PUSH B ;SAVE CHANNEL NUMBER/CHARACTER
0016' 3A 0000" LDA CONBR ;GET CONSOLE BAUD RATE CODE
0019' 4F MOV C,A ;TELEVIDEO BAUD RATE CODE TO C-REG
001A' 1E03 MVI E,3 ;SET FUNCTION NUMBER=3
001C' CD 0000:04 CALL SERIAL# ;SET CHANNEL BUAD RATE
001F' 3A 0001" LDA FFCHR ;GET FORM FEED CHARACTER
0022' B7 ORA A ;FORM FEED CHARACTER=0?
0023' 2808 JRZ ..NITX ;IF SO, CONTINUE

```

CON192 - TURBODOS OPERATING SYSTEM 19.2KB CONSOLE DRIVER
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```
0025' C1          POP      B          ;ELSE, RESTORE CHANNEL NUMBER
0026' C5          PUSH     B          ;SAVE CHANNEL NUMBER
0027' 4F          MOV      C,A        ;FORM FEED CHARACTER TO C-REG
0028' 1E02        MVI      E,2        ;SET FUNCTION NUMBER=2
002A' CD 0000:04 CALL     SERIAL# ;OUTPUT FORM FEED
002D' C1          ..NITX: POP      B          ;RESTORE CHANNEL NUMBER/CHARACTER
002E' D1          POP      D          ;RESTORE FUNCTION NUMBER
002F' C9          RET              ;DONE
;
0030'           ;CONSO:
0030' CD 0000:05 CONSI: CALL     DMS#      ;POSITION TO NEXT LINE
0033' 0D8A        .ASCIS [ACR] [ALF]
0035' C9          RET              ;DONE
;
.END
```

LSTCTS - TURBODOS OPERATING SYSTEM CLEAR-TO-SEND PRINTER DRIVER
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

; *****
; *
; * This is a printer driver for 9600 baud printers *
; * using clear-to-send handshaking (e.g. TI-810). *
; * It is coded to support up to 16 channels at once. *
; * This module is hardware-independent. All access *
; * to the serial interface hardware is accomplished *
; * via calls to the entrypoint SERIAL:: in the hard- *
; * ware dependent serial driver modules SPD442 or *
; * SPD740. *
; *****
;
; COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT LSTCTS ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0000" ; .LOC .DATA.# ;LOCATE IN DATA AREA
;
0000" 6E CTSBR:: .BYTE 6EH ;BAUD RATE CODE (9600 BAUD)
0001" 0C CTSFF:: .BYTE AFF ;FORM FEED CHARACTER
0002" 000000000000 INITC: .BYTE [16]0 ;INITIALIZATION COMPLETE FLAGS
;
0000' ; .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 21 0002" LSTDR%::LXI H,INITC ;GET INITIALIZATION COMPLETE FLAGS
0003' D5 PUSH D ;SAVE FUNCTION NUMBER
0004' 58 MOV E,B ;CHANNEL NUMBER TO DE-REG
0005' 1600 MVI D,0 ;DOUBLE LENGTH
0007' 19 DAD D ;INDEX INTO FLAGS TABLE
0008' D1 POP D ;RESTORE FUNCTION NUMBER
0009' 7E MOV A,M ;GET INITIALIZATION COMPLETE FLAG
000A' B7 ORA A ;INITIALIZATION COMPLETE FLAG SET?
000B' CC 0018' CZ ..INIT ;IF NOT, INITIALIZE LIST CHANNEL
000E' 7B MOV A,E ;GET FUNCTION NUMBER
000F' FE02 CPI 2 ;FUNCTION NUMBER=2?
0011' 281A JRZ LSTOUT ;IF SO, CONTINUE
0013' FE07 CPI 7 ;FUNCTION NUMBER=7?
0015' 2810 JRZ LSTWSR ;IF SO, CONTINUE
0017' C9 RET ;ELSE, DONE
0018' 35 ..INIT: DCR M ;SET INITIALIZATION COMPLETE FLAG
0019' D5 PUSH D ;SAVE FUNCTION NUMBER
001A' C5 PUSH B ;SAVE CHANNEL NUMBER/CHARACTER
001B' 3A 0000" LDA CTSBR ;GET BAUD RATE CODE
001E' 4F MOV C,A ;BAUD RATE CODE TO C-REG
001F' 1E03 MVI E,3 ;SET FUNCTION NUMBER=3
    
```

LST300 - TURBODOS OPERATING SYSTEM 300 BAUD LIST DRIVER
COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```
0021'   CD 0000:04           CALL   SERIAL# ;SET CHANNEL BUAD RATE
0024'   C1                   POP     B       ;RESTORE CHANNEL NUMBER/CHARACTER
0025'   D1                   POP     D       ;RESTORE FUNCTION NUMBER
0026'   C9                   RET      ;DONE

;
0027'   3A 0001"           LSTWSR: LDA   LST3FF ;GET FORM FEED CHARACTER
002A'   4F                   MOV     C,A   ;FORM FEED CHARACTER TO C-REG
002B'   1E02                MVI     E,2   ;SET FUNCTION NUMBER=2

;
002D'   C3 0000:04           LSTOUT: JMP  SERIAL# ;CONTINUE
;
.END
```

LST300 - TURBODOS OPERATING SYSTEM 300 BAUD LIST DRIVER
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

; *****
; *
; * This is a printer driver for a 300 baud TTY-like *
; * printer device connected to a serial channel 0-15. *
; * It is coded to support up to 16 channels at once. *
; * This module is hardware-independent. All access *
; * to the serial interface hardware is accomplished *
; * via calls to the entrypoint SERIAL:: in the hard- *
; * ware dependent serial driver modules SPD442 or *
; * SPD740. *
; *****
;
; COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
.IDENT LST300 ;MODULE ID
;
;INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0000" .LOC .DATA.# ;LOCATE IN DATA AREA
;
0000" 25 LST3BR::.BYTE 25H ;BAUD RATE CODE (300 BAUD)
0001" 0C LST3FF::.BYTE AFF ;FORM FEED CHARACTER
0002" 000000000000 INITC: .BYTE [16]0 ;INITIALIZATION COMPLETE FLAGS
;
0000' .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 21 0002" LSTDR%::LXI H,INITC ;GET INITIALIZATION COMPLETE FLAGS
0003' D5 PUSH D ;SAVE FUNCTION NUMBER
0004' 58 MOV E,B ;CHANNEL NUMBER TO DE-REG
0005' 1600 MVI D,0 ;DOUBLE LENGTH
0007' 19 DAD D ;INDEX INTO FLAGE TABLE
0008' D1 POP D ;RESTORE FUNCTION NUMBER
0009' 7E MOV A,M ;GET INITIALIZATION COMPLETE FLAG
000A' B7 ORA A ;INITIALIZATION COMPLETE FLAG SET?
000B' CC 0018' CZ ..INIT ;IF NOT, INITIALIZE LIST CHANNEL
000E' 7B MOV A,E ;GET FUNCTION NUMBER
000F' FE02 CPI 2 ;FUNCTION NUMBER=2?
0011' 281A JRZ LSTOUT ;IF SO, CONTINUE
0013' FE07 CPI 7 ;FUNCTION NUMBER=7?
0015' 2810 JRZ LSTWSR ;IF SO, CONTINUE
0017' C9 RET ;ELSE, DONE
0018' 35 ..INIT: DCR M ;SET INITIALIZATION COMPLETE FLAG
0019' D5 PUSH D ;SAVE FUNCTION NUMBER
001A' C5 PUSH B ;SAVE CHANNEL NUMBER/CHARACTER
001B' 3A 0000" LDA LST3BR ;GET BAUD RATE CODE
001E' 4F MOV C,A ;BAUD RATE CODE TO C-REG
001F' 1E03 MVI E,3 ;SET FUNCTION NUMBER=3
    
```

LSTCTS - TURBODOS OPERATING SYSTEM CLEAR-TO-SEND PRINTER DRIVER
COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```
0021'   CD 0000:04           CALL   SERIAL# ;SET CHANNEL BUAD RATE
0024'   C1                   POP     B      ;RESTORE CHANNEL NUMBER/CHARACTER
0025'   D1                   POP     D      ;RESTORE FUNCTION NUMBER
0026'   C9                   RET      ;DONE

;
0027'   3A 0001"           LSTWSR: LDA   CTSFF  ;GET FORM FEED CHARACTER
002A'   4F                   MOV     C,A    ;FORM FEED CHARACTER TO C-REG
002B'   1E02                MVI     E,2    ;SET FUNCTION NUMBER=2

;
002D'   C3 0000:04           LSTOUT: JMP  SERIAL# ;CONTINUE
;
.END
```

LSTETX - TURBODOS OPERATING SYSTEM ETX/ACK PRINTER DRIVER
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

; *****
; *
; * This is a printer driver for 1200 baud printers *
; * using ETX/ACK protocol (e.g., Diablo or NEC daisy). *
; * It is coded to support up to 16 channels at once. *
; * This module is hardware-independent. All access *
; * to the serial interface hardware is accomplished *
; * via calls to the entrypoint SERIAL:: in the hard- *
; * ware dependent serial driver modules SPD442 or *
; * SPD740. *
; *****
;
; COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT LSTETX ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0000" ; .LOC .DATA.# ;LOCATE IN DATA AREA
;
0000" 07 ETXBR:: .BYTE 7 ;BAUD RATE CODE (1200 BAUD)
0001" 8C ETXLEN:: .BYTE 140 ;CHARACTER COUNT BETWEEN ETX'S
0002" 03 ETXSEQ:: .BYTE 3 ;MAX ESCAPE SEQUENCE LENGTH
0003" 0C ETXFF:: .BYTE AFF ;FORM FEED CHARACTER
0004" 0000000000000000 CHRCNT: .BYTE [16]0 ;CHARACTER COUNT
0014" 0000000000000000 SEQCNT: .BYTE [16]0 ;SEQUENCE COUNT
0024" 0000000000000000 INITC: .BYTE [16]0 ;INITIALIZATION COMPLETE FLAGS
;
0000' ; .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 21 0024" LSTDR%::LXI H,INITC ;GET INITIALIZATION COMPLETE FLAGS
0003' CD 0084' CALL INDEX ;INDEX INTO FLAGS TABLE
0006' 7E MOV A,M ;GET INITIALIZATION COMPLETE FLAG
0007' B7 ORA A ;INITIALIZATION COMPLETE FLAG SET?
0008' CC 0015' CZ ..INIT ;IF NOT, INITIALIZE LIST CHANNEL
000B' 7B MOV A,E ;GET FUNCTION NUMBER
000C' FE02 CPI 2 ;FUNCTION NUMBER=2?
000E' 281A JRZ LSTOUT ;IF SO, CONTINUE
0010' FE07 CPI 7 ;FUNCTION NUMBER=7?
0012' 2810 JRZ LSTWSR ;IF SO, CONTINUE
0014' C9 RET ;ELSE, DONE
0015' 35 ..INIT: DCR M ;SET INITIALIZATION COMPLETE FLAG
0016' D5 PUSH D ;SAVE FUNCTION NUMBER
0017' C5 PUSH B ;SAVE CHANNEL NUMBER/CHARACTER
0018' 3A 0000" LDA ETXBR ;GET BAUD RATE CODE
001B' 4F MOV C,A ;BAUD RATE CODE TO C-REG
001C' 1E03 MVI E,3 ;SET FUNCTION NUMBER=3
    
```

LSTETX - TURBODOS OPERATING SYSTEM ETX/ACK PRINTER DRIVER
COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

001E'  CD 0000:04          CALL  SERIAL# ;SET CHANNEL BUAD RATE
0021'  C1                  POP    B      ;RESTORE CHANNEL NUMBER/CHARACTER
0022'  D1                  POP    D      ;RESTORE FUNCTION NUMBER
0023'  C9                  RET     ;DONE

;
0024'  3A 0003"          ;LSTWSR: LDA  ETXFF  ;GET FORM FEED CHARACTER
0027'  4F                  MOV    C,A    ;FORM FEED CHARACTER TO C-REG
0028'  1E02               MVI    E,2    ;SET FUNCTION NUMBER=2

;
002A'  CD 007C'          ;LSTOUT: CALL ..GCCA ;GET CHARACTER COUNT ADDRESS
002D'  7E                  MOV    A,M    ;GET CHARACTER COUNT
002E'  21 0001"         LXI    H,ETXLEN ;GET CHARACTER COUNT BETWEEN ETX

0031'  BE                  CMP    M      ;MAX CHARACTER COUNT OUTSTANDING?
0032'  381B               JRC    ..OUT ;IF NOT, CONTINUE
0034'  CD 0081'          CALL ..GSCA ;ELSE, GET SEQUENCE COUNT ADDRESS
0037'  7E                  MOV    A,M    ;GET SEQUENCE COUNT
0038'  B7                  ORA    A      ;IN ESCAPE SEQUENCE?
0039'  2014               JRNZ ..OUT ;IF SO, CONTINUE
003B'  C5                  PUSH   B      ;ELSE, SAVE OUTPUT CHARACTER
003C'  0E03               MVI    C,AETX ;GET ETX CHARACTER
003E'  CD 0074'          CALL ..SOUT ;OUTPUT ETX CHARACTER
0041'  CD 006B'          ;..WAIT: CALL ..SIN ;ELSE, GET SERIAL INPUT
0044'  E67F               ANI    7FH   ;STRIP SIGN BIT
0046'  D606               SUI    AACK  ;CHARACTER=ACK?
0048'  20F7               JRNZ ..WAIT ;IF NOT, WAIT
004A'  CD 007C'          CALL ..GCCA ;ELSE, GET CHARACTER COUNT ADDRESS
004D'  77                  MOV    M,A   ;RESET CHARACTER COUNT
004E'  C1                  POP    B      ;RESTORE OUTPUT CHARACTER
004F'  79                  ;..OUT: MOV   A,C ;GET OUTPUT CHARACTER
0050'  E67F               ANI    7FH   ;STRIP SIGN BIT
0052'  FE1B               CPI    AESC  ;CHARACTER-ESCAPE?
0054'  2007               JRNZ ..NESC ;IF NOT, CONTINUE
0056'  CD 0081'          CALL ..GSCA ;ELSE, GET SEQUENCE COUNT ADDRESS
0059'  3A 0002"         LDA    ETXSEQ ;GET MAX ESCAPE SEQUENCE LENGTH
005C'  77                  MOV    M,A   ;SET SEQUENCE COUNT
005D'  CD 0074'          ;..NESC: CALL ..SOUT ;OUTPUT CHARACTER
0060'  CD 007C'          CALL ..GCCA ;GET CHARACTER COUNT ADDRESS
0063'  34                  INR    M     ;INCREMENT CHARACTER COUNT
0064'  CD 0081'          CALL ..GSCA ;GET SEQUENCE COUNT ADDRESS
0067'  35                  DCR    M     ;DECREMENT SEQUENCE COUNT
0068'  F0                  RP      ;IF POSITIVE, DONE
0069'  34                  INR    M     ;ELSE, RESTORE COUNT TO 0
006A'  C9                  RET     ;DONE
006B'  C5                  ;..SIN: PUSH  B   ;SAVE CHANNEL NUMBER/CHARACTER
006C'  D5                  PUSH   D     ;SAVE FUNCTION NUMBER
006D'  1E01               MVI    E,1   ;SET FUNCTION NUMBER=1
006F'  CD 0000:04        CALL  SERIAL# ;GET SERIAL INPUT
0072'  1805               JMPR ..SIOC ;CONTINUE
0074'  C5                  ;..SOUT: PUSH  B   ;SAVE CHANNEL NUMBER/CHARACTER
0075'  D5                  PUSH   D     ;SAVE FUNCTION NUMBER
0076'  CD 0000:04        CALL  SERIAL# ;OUTPUT CHARACTER
0079'  D1                  ;..SIOC: POP   D   ;RESTORE FUNCTION NUMBER
007A'  C1                  POP    B     ;RESTORE CHANNEL NUMBER/CHARACTER

```

LSTETX - TURBODOS OPERATING SYSTEM ETX/ACK PRINTER DRIVER
COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```
007B'  C9          RET          ;DONE
007C'  21 0004"   ..GCCA: LXI    H,CHRCNT ;GET CHARACTER COUNT TABLE
007F'  1803      JMR          INDEX   ;CONTINUE
0081'  21 0014"   ..GSCA: LXI    H,SEQCNT ;GET SEQUENCE COUNT TABLE
;
0084'  D5        INDEX: PUSH   D        ;SAVE FUNCTION NUMBER
0085'  58        MOV      E,B      ;CHANNEL NUMBER TO DE-REG
0086'  1600      MVI      D,0      ;DOUBLE LENGTH
0088'  19        DAD      D        ;INDEX INTO TABLE
0089'  D1        POP      D        ;RESTORE FUNCTION NUMBER
008A'  C9        RET          ;DONE
;
.END
```

LSTXON - TURBODOS OPERATING SYSTEM XON/XOFF PRINTER DRIVER
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

; *****
; *
; * This is a printer driver for 1200 baud printers
; * using XON/XOFF protocol (e.g., Diablo, Okidata).
; * It is coded to support up to 16 channels at once.
; * This module is hardware-independent. All access
; * to the serial interface hardware is accomplished
; * via calls to the entrypoint SERIAL:: in the hard-
; * ware dependent serial driver modules SPD442 or
; * SPD740.
; *
; *****
;
; COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT LSTXON ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0000" .LOC .DATA.# ;LOCATE IN DATA AREA
;
0000" 07 XONBR:: .BYTE 7 ;BAUD RATE CODE (1200 BAUD)
0001" 0C XONFF:: .BYTE AFF ;FORM FEED CHARACTER
0002" 000000000000 INITC: .BYTE [16]0 ;INITIALIZATION COMPLETE FLAGS
;
0000' .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 21 0002" LSTDR%::LXI H,INITC ;GET INITIALIZATION COMPLETE FLAGS
0003' D5 PUSH D ;SAVE FUNCTION NUMBER
0004' 58 MOV E,B ;CHANNEL NUMBER TO DE-REG
0005' 1600 MVI D,0 ;DOUBLE LENGTH
0007' 19 DAD D ;INDEX INTO FLAGS TABLE
0008' D1 POP D ;RESTORE FUNCTION NUMBER
0009' 7E MOV A,M ;GET INITIALIZATION COMPLETE FLAG
000A' B7 ORA A ;INITIALIZATION COMPLETE FLAG SET?
000B' CC 0018' CZ ..INIT ;IF NOT, INITIALIZE LIST CHANNEL
000E' 7B MOV A,E ;GET FUNCTION NUMBER
000F' FE02 CPI 2 ;FUNCTION NUMBER=2?
0011' 281A JRZ LSTOUT ;IF SO, CONTINUE
0013' FE07 CPI 7 ;FUNCTION NUMBER=7?
0015' 2810 JRZ LSTWSR ;IF SO, CONTINUE
0017' C9 RET ;ELSE, DONE
0018' 35 ..INIT: DCR M ;SET INITIALIZATION COMPLETE FLAG
0019' D5 PUSH D ;SAVE FUNCTION NUMBER
001A' C5 PUSH B ;SAVE CHANNEL NUMBER/CHARACTER
001B' 3A 0000" LDA XONBR ;GET BAUD RATE CODE
001E' 4F MOV C,A ;BAUD RATE CODE TO C-REG
001F' 1E03 MVI E,3 ;SET FUNCTION NUMBER=3
    
```

LSTXON - TURBODOS OPERATING SYSTEM XON/XOFF PRINTER DRIVER
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

0021'   CD 0000:04           CALL   SERIAL# ;SET CHANNEL BUAD RATE
0024'   C1                   POP     B           ;RESTORE CHANNEL NUMBER/CHARACTER
0025'   D1                   POP     D           ;RESTORE FUNCTION NUMBER
0026'   C9                   RET      ;DONE
;
0027'   3A 0001"           LSTWSR: LDA   XONFF  ;GET FORM FEED CHARACTER
002A'   4F                   MOV   C,A      ;FORM FEED CHARACTER TO C-REG
002B'   1E02                MVI   E,2      ;SET FUNCTION NUMBER=2
;
002D'   CD 0048'           LSTOUT: CALL  ..SST  ;GET SERIAL STATUS
0030'   B7                   ORA   A        ;CHARACTER AVAILABLE?
0031'   2812                JRZ   ..OUT    ;IF NOT, CONTINUE
0033'   CD 0051'           CALL  ..SIN    ;ELSE, GET SERIAL INPUT
0036'   E67F                ANI   7FH     ;STRIP SIGN BIT
0038'   FE13                CPI   ADC3    ;CHARACTER=DC3 (XOFF)?
003A'   20F1                JRNZ  LSTOUT  ;IF NOT, WAIT
003C'   CD 0051'           ..WAIT: CALL  ..SIN  ;GET SERIAL INPUT
003F'   E67F                ANI   7FH     ;STRIP SIGN BIT
0041'   FE11                CPI   ADC1    ;CHARACTER=DC1 (XON)?
0043'   20F7                JRNZ  ..WAIT  ;IF NOT, WAIT
0045'   C3 0000:04         ..OUT: JMP   SERIAL# ;OUTPUT CHARACTER
0048'   C5                   ..SST: PUSH  B        ;SAVE CHANNEL NUMBER/CHARACTER
0049'   D5                   PUSH  D        ;SAVE FUNCTION NUMBER
004A'   1E00                MVI   E,0     ;SET FUNCTION NUMBER=0
004C'   CD 0000:04         CALL  SERIAL# ;GET SERIAL STATUS
004F'   1807                JMPR  ..SSIC  ;CONTINUE
0051'   C5                   ..SIN: PUSH  B        ;SAVE CHANNEL NUMBER/CHARACTER
0052'   D5                   PUSH  D        ;SAVE FUNCTION NUMBER
0053'   1E01                MVI   E,1     ;SET FUNCTION NUMBER=1
0055'   CD 0000:04         CALL  SERIAL# ;GET SERIAL STATUS
0058'   D1                   ..SSIC: POP   D        ;RESTORE FUNCTION NUMBER
0059'   C1                   POP   B        ;RESTORE CHANNEL NUMBER/CHARACTER
005A'   C9                   RET      ;DONE
;
.END

```

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```
*****
;
;
; *
; * This is a fairly complex network circuit driver *
; * which runs in an IMS 8000 master processor and *
; * which communicates with a simple circuit driver *
; * (SCD740) running in an IMS 740 slave processor *
; * board. This driver accomodates up to sixteen *
; * IMS 740 slave boards. *
; *
; * The IMS 740 slave communicates with the master *
; * processor over the S-100 bus via a byte-parallel *
; * transfer which is handled by programmed I/O by *
; * both processors. The IMS 740 slave appears to the *
; * master processor as an ordinary port-addressed *
; * peripheral device. The interface on the 740 board *
; * is an Intel 8255 parallel I/O controller chip, *
; * and coordination between the master and slave is *
; * handled by the status bits of the 8255. The *
; * master processor may interrupt the slave to see *
; * if it is still healthy, and can also reset and *
; * download the slave. *
; *
; * This driver maintains a "watchdog timer" for each *
; * of the slave processors. If it has not received *
; * any messages from a particular slave processor *
; * after a one-second interval, it polls that slave *
; * by interrupting it and looking for an acknowledge- *
; * ment from the slave's interrupt service routine. *
; * If no acknowledgement is received within a brief *
; * timeout interval, then this driver concludes that *
; * the slave has crashed. The driver informs Turbo- *
; * DOS of the crash (so TurboDOS can take its re- *
; * covery action), and then the driver resets and *
; * downloads a fresh copy of the operating system *
; * into the failed slave. *
; *
; * The IMS 740 slave board has a start-up ROM which *
; * is programmed with the contents of the module *
; * SPB740 to handle the slave-end of the download *
; * procedure. At the start of a download, this dri- *
; * ver sends (and the SPB740 slave ROM receives) a *
; * loader module LOD740 to the slave. This loader *
; * module handles the remainder of the downloading *
; * task by making standard TurboDOS network download *
; * requests to load the full slave operating system *
; * from a file OSSLAIVE.SYS on the master's disk. *
; *
; * *****
;
; COPYRIGHT (C) 1982. SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
```

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

;
; VERSION: EXAMPLE
;
.IDENT MCD740 ;MODULE ID
;
.INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0005 IBF = 5 ;INPUT BUFFER FULL BIT
0007 OBFN = 7 ;INPUT BUFFER FULL (NOT) BIT
;
0000 RESPC0 = 00H ;RESET PC0 COMMAND
0001 SETPC0 = 01H ;SET PC0 COMMAND
0002 RESPC1 = 02H ;RESET PC1 COMMAND
0003 SETPC1 = 03H ;SET PC1 COMMAND
0008 RESPC4 = 08H ;RESET PC4 COMMAND
0009 SETPC4 = 09H ;SET PC4 COMMAND
000A RESPC5 = 0AH ;RESET PC5 COMMAND
000B SETPC5 = 0BH ;SET PC5 COMMAND
000C RESPC6 = 0CH ;RESET PC6 COMMAND
000D SETPC6 = 0DH ;SET PC6 COMMAND
000C RESPC7 = 0CH ;RESET PC7 COMMAND
000D SETPC7 = 0DH ;SET PC7 COMMAND
;
00C0 PPMODE = 0COH ;PARALLEL PORT MODE WORD
; (MODE 2/MODE 0 OUT)
;
0000" ; .LOC .DATA.# ;LOCATE IN DATA AREA
;
0000" 02 NMB740::.BYTE 2 ;NUMBER OF IMS 740 SLAVES
;
0001" 00 CKT740::.BYTE 00H ;IMS 740 CIRCUIT NUMBER
;
0002" PAT740:: ;IMS 740 SLAVE PORT ADDRESS TABLE
0002" 40 .BYTE 40H
0003" 44 .BYTE 44H
0004" 48 .BYTE 48H
0005" 4C .BYTE 4CH
0006" 50 .BYTE 50H
0007" 54 .BYTE 54H
0008" 58 .BYTE 58H
0009" 5C .BYTE 5CH
000A" 60 .BYTE 60H
000B" 64 .BYTE 64H
000C" 68 .BYTE 68H
000D" 6C .BYTE 6CH
000E" 70 .BYTE 70H
000F" 74 .BYTE 74H
0010" 78 .BYTE 78H
0011" 7C .BYTE 7CH
;
0012" SST740:: ;IMS 740 SLAVE SUFFIX LETTER TABLE
0012" 20 .BYTE ASP
0013" 20 .BYTE ASP
0014" 20 .BYTE ASP
    
```

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0015" 20 .BYTE ASP
0016" 20 .BYTE ASP
0017" 20 .BYTE ASP
0018" 20 .BYTE ASP
0019" 20 .BYTE ASP
001A" 20 .BYTE ASP
001B" 20 .BYTE ASP
001C" 20 .BYTE ASP
001D" 20 .BYTE ASP
001E" 20 .BYTE ASP
001F" 20 .BYTE ASP
0020" 20 .BYTE ASP
0021" 20 .BYTE ASP
;
0022" 00 MAXLEN: .BYTE 0 ;MAXIMUM MESSAGE LENGTH
0023" 000F CURSLV: .WORD 000FH ;CURRENT SLAVE PROCESSOR NUMBER
;
0025" 0000 RCVSPH: .WORD 0 ;RECEIVE MESSAGE SEMAPHORE
0027" 0027" ..RCVH: .WORD ..RCVH
0029" 0027" .WORD ..RCVH
;
002B" 000000000000 POLCNT: .BYTE [16]0 ;POLL ROUTINE TICK COUNTS
;
0000:04 .LOC .INIT.# ;LOCATE IN INITIALIZATION AREA
;
0000:04 C9 CKTIN%::RET ;DONE
;
0000' .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 79 CKTD%::MOV A,C ;GET FUNCTION NUMBER
0001' B7 ORA A ;FUNCTION NUMBER=0?
0002' 2805 JRZ RCVMSG ;IF SO, CONTINUE
0004' 3D DCR A ;FUNCTION NUMBER=1?
0005' CA 0060' JZ SNDMSG ;IF SO, CONTINUE
0008' C9 RET ;ELSE, DONE
;
0009' 13 RCVMSG: INX D ;ADVANCE PAST LINK POINTERS
000A' 13 INX D
000B' 13 INX D
000C' 13 INX D
000D' D5 PUSH D ;SAVE MESSAGE BUFFER ADDRESS
000E' 1A LDAX D ;GET MAXIMUM MESSAGE LENGTH
000F' 32 0022" STA MAXLEN ;SAVE MAXIMUM MESSAGE LENGTH
0012' 11 00F0' ..RCVL: LXI D,POL740 ;GET IMS 740 POLL ROUTINE
0015' CD 0000:05 LNKPOL# ;LINK POLL ROUTINE ON POLL LIST
0018' 21 0025" LXI H,RCVSPH ;GET RECEIVE MESSAGE SEMAPHORE
001B' CD 0000:06 CALL WAIT# ;WAIT FOR REQUEST
001E' CD 0170' CALL RMCOM ;DO COMMON SETUP
0021' D5 PUSH D ;SAVE SLAVE PROCESSOR NUMBER
0022' 200C JRNZ ..RIP ;IF REQUEST IN PROGRESS, CONTINUE
0024' CBC6 SET O,M ;ELSE, SET REQUEST IN PROGRESS FLA
0026' 0C INR C ;CALC CONTROL PORT
0027' 3E01 MVI A,SETPCO ;SET PCO (INTERRUPT)
0029' ED79 OUTP A ;ASSERT INTERRUPT

```

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

002B' 3E00          MVI    A,RESPCO ;RESET PCO (INTERRUPT)
002D' ED79          OUTP   A          ;RELEASE INTERRUPT
002F' 0D            DCR    C          ;CALC PORT C ADDRESS
0030' CD 013A'     ..RIP: CALL  INBYT   ;INPUT BYTE FROM SLAVE PROCESSOR
0033' D1            POP    D          ;RESTORE SLAVE PROCESSOR NUMBER
0034' 380D          JRC    ..IERR  ;IF ERROR, CONTINUE
0036' FE06          CPI    AACK   ;RESPONSE=ACK?
0038' 280C          JRZ    ..RCV  ;IF SO, CONTINUE
003A' FE15          CPI    ANAK   ;RESPONSE=NACK?
003C' 2005          JRNZ   ..IERR  ;IF NOT, CONTINUE
003E' CD 0168'     CALL  SETTC   ;ELSE, SET TICK COUNT
0041' 18CF          JMPR   ..RCVL  ;CONTINUE
0043' E1            ..IERR: POP    H          ;RESTORE MESSAGE BUFFER ADDRESS
0044' 1842          JMPR   ERRCOM  ;CONTINUE
0046' E1            ..RCV: POP    H          ;RESTORE MESSAGE BUFFER ADDRESS
0047' 0601          MVI    B,1     ;GET LENGTH OF MESSAGE LENGTH
0049' CD 0130'     CALL  RCV740  ;RECEIVE MESSAGE LENGTH
004C' 383A          JRC    ERRCOM  ;IF ERROR, CONTINUE
004E' 2B            DCX    H          ;ELSE, BACK UP TO MESSAGE LENGTH
004F' 3A 0022"     LDA    MAXLEN  ;GET MAXIMUM MESSAGE LENGTH
0052' BE            CMP    M          ;MAXIMUM MESSAGE LENGTH EXCEEDED?
0053' 3833          JRC    ERRCOM  ;IF SO, CONTINUE
0055' 46            MOV    B,M     ;ELSE, GET MESSAGE LENGTH
0056' 23            INX    H          ;RESTORE MESSAGE BUFFER ADDRESS
0057' 05            DCR    B          ;DECREMENT MESSAGE LENGTH
0058' 282E          JRZ    ERRCOM  ;IF MESSAGE LENGTH=0, CONTINUE
005A' CD 0130'     CALL  RCV740  ;ELSE, RECEIVE REMAINDER OF MESSAG
005D' D0            RNC          ;IF NO ERROR, DONE
005E' 1828          JMPR   ERRCOM  ;ELSE, CONTINUE

;
0060' EB            ;SNDMSG: XCHG   ;MESSAGE BUFFER ADDRESS TO HL-REG
0061' 23            INX    H          ;ADVANCE PAST LINK POINTERS
0062' 23            INX    H
0063' 23            INX    H
0064' 23            INX    H
0065' E5            PUSH   H          ;SAVE MESSAGE BUFFER ADDRESS
0066' 23            INX    H          ;ADVANCE TO MESSAGE DESTINATION ID
0067' 5E            MOV    E,M     ;GET MESSAGE DESTINATION ID
0068' 1600          MVI    D,0     ;DOUBLE LENGTH
006A' 1D            DCR    E          ;DECREMENT MESSAGE DESTINATION ID
006B' CD 0174'     CALL  SMCOM   ;DO COMMON SETUP
006E' E1            POP    H          ;RESTORE MESSAGE BUFFER ADDRESS
006F' 7E            MOV    A,M     ;GET MESSAGE LENGTH
0070' B7            ORA    A          ;MESSAGE LENGTH=0?
0071' 2810          JRZ    ..X     ;IF SO, CONTINUE
0073' D5            PUSH   D          ;ELSE, SAVE SLAVE PROCESSOR NUMBER
0074' 46            MOV    B,M     ;GET MESSAGE LENGTH
0075' 05            DCR    B          ;DECREMENT MESSAGE LENGTH
0076' C5            PUSH   B          ;SAVE MESSAGE LENGTH
0077' 0601          MVI    B,1     ;GET LENGTH OF MESSAGE LENGTH
0079' CD 0126'     CALL  SND740  ;SEND MESSAGE LENGTH TO SLAVE
007C' C1            POP    B          ;RESTORE MESSAGE LENGTH
007D' D4 0126'     CNC    SND740 ;IF NO ERROR, SEND MESSAGE
0080' D1            POP    D          ;RESTORE SLAVE PROCESSOR NUMBER

```

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0081' 3805 JRC ERRCOM ;IF ERROR, CONTINUE
0083' CD 0168' ..X: CALL SETTC ;ELSE, SET TICK COUNT
0086' AF XRA A ;SET RETURN CODE=0
0087' C9 RET ;DONE

;
0088' CD 0092' ;ERRCOM: CALL RESSLV ;RESET SLAVE PROCESSOR
008B' ED5B 0000:07 LDED SID740# ;GET SLAVE PROCESSOR SOURCE ID
008F' 3EFF MVI A,OFFH ;SET RETURN CODE=OFFH
0091' C9 RET ;DONE

;
0092' 3A 0001" RESSLV: LDA CKT740 ;GET IMS 740 CIRCUIT NUMBER
0095' 67 MOV H,A ;IMS 740 CIRCUIT NUMBER TO H-REG
0096' 2E00 MVI L,0 ;SET CIRCUIT NODE ADDRESS TO 0
0098' 22 0000:08 SHLD DID740# ;SET SLAVE PROCESSOR DESTINATION I
009B' 3A 0023" LDA CURSLV ;GET CURRENT SLAVE PROCESSOR NUMBE
009E' 3C INR A ;INCREMENT SLAVE PROCESSOR NUMBER
009F' 6F MOV L,A ;SLAVE PROCESSOR NUMBER TO L-REG
00A0' 22 0000:07 SHLD SID740# ;SET SLAVE PROCESSOR SOURCE ID
00A3' 22 0000:09 SHLD ORG740# ;SET SLAVE PROCESSOR ORIGIN
00A6' 2A 0023" LHL D CURSLV ;GET CURRENT SLAVE PROCESSOR NUMBE
00A9' 11 0012" LXI D,SST740 ;GET SLAVE SUFFIX LETTER TABLE
00AC' 19 DAD D ;INDEX INTO SLAVE SUFFIX TABLE
00AD' 7E MOV A,M ;GET SLAVE O/S SUFFIX LETTER
00AE' 32 0000:0A STA SSL740# ;SET SLAVE SUFFIX LETTER
00B1' 0C INR C ;CALC CONTROL PORT ADDRESS
00B2' 3ECO MVI A,PPMODE ;GET PARALLEL PORT MODE WORD
00B4' ED79 OUTP A ;INITIALIZE 8255
00B6' 3E03 MVI A,SETPC1 ;SET PC1 (RESET)
00B8' ED79 OUTP A ;ASSERT RESET
00BA' 0D DCR C ;CALC PORT A ADDRESS
00BB' 0D DCR C
00BC' 0D DCR C
00BD' ED78 INP A ;CLEAR PORT A INPUT
00BF' 0C INR C ;CALC CONTROL PORT ADDRESS
00C0' 0C INR C
00C1' 0C INR C
00C2' CD 00EB' CALL ..DLY ;DELAY
00C5' 3E02 MVI A,RESPC1 ;RESET PC1 (RESET)
00C7' ED79 OUTP A ;RELEASE RESET
00C9' CD 00EB' CALL ..DLY ;DELAY
00CC' 0D DCR C ;CALC PORT C ADDRESS
00CD' 21 0000:0B LXI H,LAD740# ;GET LOAD ADDRESS/LENGTH
00D0' 0604 MVI B,4 ;GET LENGTH OF LOAD ADDRESS/LENGTH
00D2' CD 0126' CALL SND740 ;SEND LOAD ADDRESS/LENGTH
00D5' D8 RC ;IF ERROR, DONE
00D6' ED5B 0000:0C LDED LEN740# ;GET LOAD LENGTH
00DA' 43 MOV B,E ;LSB OF LOAD LENGTH TO B-REG
00DB' 7B MOV A,E ;GET LSB OF LOAD LENGTH
00DC' B7 ORA A ;LSB OF LOAD LENGTH=0?
00DD' 2001 JRNZ ..LDL ;IF NOT, CONTINUE
00DF' 15 DCR D ;ELSE, DECREMENT MSB OF LOAD LENGT
00E0' D5 ..LDL: PUSH D ;SAVE LOAD LENGTH
00E1' CD 0126' CALL SND740 ;SEND UP TO 256 BYTES OF BOOT CODE
00E4' D1 POP D ;RESTORE LOAD LENGTH

```

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

00E5'   D8           RC           ;IF ERROR, DONE
00E6'   15          DCR          D           ;ELSE, DECREMENT LSB OF LOAD LENGT:
00E7'   F2 00E0'   JP           ..LDL       ;IF MORE TO SEND, CONTINUE
00EA'   C9          RET          ;ELSE, DONE
00EB'   0600       ..DLY: MVI      B,0       ;INITIALIZE DELAY COUNT
00ED'   10FE       ..DLYL: DJNZ   ..DLYL    ;DELAY
00EF'   C9          RET          ;DONE

;
00F0'   0000       POL740: .WORD  0         ;SUCCESSOR LINK POINTER
00F2'   0000       .WORD  0         ;PREDECESSOR LINK POINTER

;
00F4'   3A 0000"   LDA          NMB740   ;GET NUMBER OF IMS 740 PROCESSORS
00F7'   B7         ORA          A         ;NUMBER OF IMS 740 PROCESSORS=0?
00F8'   C8         RZ           ;IF SO, DONE
00F9'   3D         DCR          A         ;DECREMENT NUMBER OF PROCESSORS
00FA'   E60F      ANI          OFH        ;LIMIT NUMBER OF PROCESSORS TO 16
00FC'   21 0023"   LXI          H,CURSLV ;GET CURRENT SLAVE NUMBER
00FF'   34         INR          M         ;INCREMENT CURRENT SLAVE NUMBER
0100'   BE        CMP          M         ;VALID SLAVE PROCESSOR NUMBER?
0101'   3002      JRNC        ..VSPN    ;IF SO, CONTINUE
0103'   3600      MVI          M,0       ;ELSE, SET SLAVE PROCESSOR NUMBER=
0105'   CD 0170'   ..VSPN: CALL   RMCOM    ;DO COMMON SETUP
0108'   C0        RNZ          ;IF REQUEST IN PROGRESS SET, DONE
0109'   ED78      INP          A         ;ELSE, GET SLAVE PROCESSOR STATUS
010B'   CB6F      BIT          IBF,A     ;INPUT BUFFER FULL SET?
010D'   2804      JRZ         ..CTC     ;IF NOT, CONTINUE
010F'   CBC6      SET          0,M      ;ELSE, SET REQUEST IN PROGRESS FLA
0111'   1807      JMPR       ..SIG     ;CONTINUE
0113'   CD 0182'   ..CTC: CALL   GETCTC   ;GET CURRENT TICK COUNT
0116'   96        SUB          M         ;CALC ELAPSED NUMBER OF TICKS
0117'   FE3C      CPI          60       ;MINIMUM NUMBER OF TICKS ELAPSED?
0119'   D8        RC           ;IF NOT, DONE
011A'   21 00F0'   ..SIG: LXI          H,POL740 ;ELSE, GET IMS 740 POLL ROUTINE
011D'   CD 0000:0D CALL   UNLINK# ;UNLINK POLL ROUTINE FROM POLL LIS
0120'   21 0025"   LXI          H,RCVSPH ;GET RECEIVE MESSAGE SEMAPHORE
0123'   C3 0000:0E JMP    SIGNAL# ;SIGNAL PROCESS AS READY

;
0126'   7E        SND740: MOV     A,M     ;GET BYTE FROM BUFFER
0127'   23        INX          H
0128'   CD 0151'   CALL   OUTBYT ;OUTPUT BYTE
012B'   D8        RC           ;IF TIME-OUT, DONE
012C'   10F8     DJNZ       SND740 ;ELSE, CONTINUE
012E'   AF        XRA          A         ;SET RETURN CODE=0
012F'   C9        RET          ;DONE

;
0130'   CD 013A'   RCV740: CALL   INBYT  ;INPUT BYTE
0133'   D8        RC           ;IF TIME-OUT, DONE
0134'   77        MOV          M,A      ;ELSE, STORE BYTE IN BUFFER
0135'   23        INX          H
0136'   10F8     DJNZ       RCV740 ;CONTINUE
0138'   AF        XRA          A         ;SET RETURN CODE=0
0139'   C9        RET          ;DONE

;
013A'   1E00     INBYT: MVI     E,0     ;INITIALIZE TIME OUT COUNTER

```

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

013C'   ED50           ;..WTL:  INP      D      ;GET SLAVE PROCESSOR STATUS
013E'   CB6A           BIT      IBF,D   ;INPUT BUFFER FULL SET?
0140'   2007           JRNZ    ..IBF   ;IF SO, CONTINUE
0142'   1D             DCR      E      ;ELSE, DECREMENT TIME OUT COUNT
0143'   20F7           JRNZ    ..WTL   ;CONTINUE
0145'   3EFF           MVI     A,OFFH ;SET RETURN CODE=OFFH
0147'   37            STC      ;SET CARRY FLAG
0148'   C9            RET      ;DONE
0149'   OD           ;..IBF:  DCR      C      ;CALC PORT A ADDRESS
014A'   OD            DCR      C
014B'   ED78           INP     A      ;INPUT BYTE FROM PORT A
014D'   OC            INR     C      ;CALC PORT C ADDRESS
014E'   OC            INR     C
014F'   B7            ORA     A      ;CLEAR CARRY FLAG
0150'   C9            RET      ;DONE

;
0151'   1E00           OUTBYT: MVI     E,0    ;INITIALIZE TIME OUT COUNTER
0153'   ED50           ;..WTL:  INP      D      ;GET SLAVE PROCESSOR STATUS
0155'   CB7A           BIT      OBFN,D  ;OUTPUT BUFFER FULL (NOT) SET?
0157'   2007           JRNZ    ..NOBF   ;IF SO, CONTINUE
0159'   1D             DCR      E      ;ELSE, DECREMENT TIME OUT COUNT
015A'   20F7           JRNZ    ..WTL   ;CONTINUE
015C'   3EFF           MVI     A,OFFH ;SET RETURN CODE=OFFH
015E'   37            STC      ;SET CARRY FLAG
015F'   C9            RET      ;DONE
0160'   OD           ;..NOBF: DCR      C      ;CALC PORT A ADDRESS
0161'   OD            DCR      C
0162'   ED79           OUTP    A      ;OUTPUT BYTE TO PORT A
0164'   OC            INR     C      ;CALC PORT C ADDRESS
0165'   OC            INR     C
0166'   B7            ORA     A      ;CLEAR CARRY FLAG
0167'   C9            RET      ;DONE

;
0168'   CD 0174'      ;SETTC: CALL    SMCOM   ;GET TICK COUNT ADDRESS
016B'   CD 0182'      CALL    GETCTC  ;GET CURRENT TICK COUNT
016E'   77            MOV     M,A     ;SET TICK COUNT
016F'   C9            RET      ;DONE

;
0170'   ED5B 0023"    RMCOM: LDED    CURSLV ;GET CURRENT SLAVE PROCESSOR NUMBE
;
0174'   21 0002"      SMCOM: LXI     H,PAT740 ;GET IMS 740 PORT ADDRESS TABLE
0177'   19            DAD     D      ;CALC IMS 740 PORT ADDRESS
0178'   4E            MOV     C,M     ;DATA PORT ADDRESS TO C-REG
0179'   OC            INR     C      ;CALC PORT C ADDRESS
017A'   OC            INR     C
017B'   21 002B"      LXI     H,POLCNT ;GET POLL ROUTINE TICK COUNTS
017E'   19            DAD     D      ;INDEX INTO TICK COUNTS
017F'   CB46           BIT     O,M     ;REQUEST IN PROGRESS FLAG SET?
0181'   C9            RET      ;DONE

;
0182'   3A 0000:OF    GETCTC: LDA     TICCNT# ;GET CURRENT TICK COUNT
0185'   E6FE           ANI     OFEH   ;STRIP BIT 0
0187'   C9            RET      ;DONE
;

```

PSA Macro Assembler [C12011-0102]

Page 8

MCD740 - TURBODOS OPERATING SYSTEM MASTER CIRCUIT DRIVER (IMS 740)
COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

.PRGEND

LOD740 - TURBODOS OPERATING SYSTEM INTERMEDIATE BOOTSTAP (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

; *****
; *
; * At the start of a download of an IMS 740 slave
; * processor board, the master circuit driver MCD740
; * sends this loader to the slave. It is loaded into
; * slave memory by the slave ROM module SPB740. This
; * loader module handles the remainder of the down-
; * loading task by making standard TurboDOS network
; * download requests to load the full slave operating
; * system from a file OSSLAIVE.SYS on the master's
; * disk.
; *
; *****
;
; COPYRIGHT (C) 1982. SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT  LOD740          ;MODULE ID
;
; .INSERT DREQUATE      ;DRIVER SYMBOLIC EQUIVALENCES
;
0000      PIOVEC = 00H          ;PIO INTERRUPT VECTOR ADDRESS
;
0020      PORTAD = 20H         ;8255 PORT A DATA REGISTER
0024      PIOADR = 24H         ;PIO PORT A DATA REGISTER
0025      PIOBDR = 25H         ;PIO PORT B DATA REGISTER
0026      PIOACR = 26H         ;PIO PORT A CONTROL REGISTER
0027      PIOBCR = 27H         ;PIO PORT B CONTROL REGISTER
;
0004      PORTC0 = 4           ;PORT C DATA BIT 0 (INT)
0005      PORTC5 = 5           ;PORT C DATA BIT 5 (IBF)
0006      PORTC7 = 6           ;PORT C DATA BIT 7 (OBF)
0007      RAMPER = 7           ;RAM PARITY ERROR
;
0006      ROMENA = 6           ;ROM ENABLE BIT
0007      PERRES = 7          ;PARITY ERROR RESET
;
0000'      .LOC      .PROG.# ;LOCATE IN PROGRAM AREA
;
0000'      OA00      LAD740::WORD  OA00H  ;SLAVE PROCESSOR BOOT LOAD ADDRESS
0002'      00CF      LEN740::WORD  SPBLEN ;SLAVE PROCESSOR BOOT LOAD LENGTH
;
; .DEFINE RELOC[ADDR]=[(ADDR-SPB740)+OA00H] ;RELOCATION MACR
;
0004'      F3        SPB740: DI          ;DISABLE INTERRUPTS
0005'      31 0900   LXI      SP,900H   ;INITIALIZE STACK POINTER
0008'      3E09     MVI      A,09H     ;GET INTERRUPT VECTOR PAGE
000A'      ED47     STAI     ;SET INTERRUPT PAGE REGISTER
000C'      ED5E     IM2      ;SET INTERRUPT MODE 2

```

LOD740 - TURBODOS OPERATING SYSTEM INTERMEDIATE BOOTSTAP (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

000E' 21 0A8E      LXI      H,RELOC[PIOISR] ;GET PIO INT SERVICE ADDR
0011' 22 0900      SHLD     0900H ;SET INTERRUPT VECTOR ADDRESS
0014' 3E00         MVI      A,PIOVEC ;GET PIO INTERRUPT SERVICE VECTO
0016' D326         OUT      PIOACR ;OUTPUT INTERRUPT SERVICE VECTOR
0018' 3ECF         MVI      A,OCFH ;GET PIO A MODE WORD (MODE 3)
001A' D326         OUT      PIOACR ;OUTPUT PIO A MODE WORD
001C' 3EFF         MVI      A,OFFH ;GET PIO A MODE 3 MODE WORD
001E' D326         OUT      PIOACR ;OUTPUT PIO A MODE 3 MODE WORD
0020' 3EB7         MVI      A,OB7H ;GET PIO A INTERRUPT CONTROL WORD
0022' D326         OUT      PIOACR ;OUTPUT INTERRUPT CONTROL WORD
0024' 3EEF         MVI      A,0EFH ;GET PIO A INTERRUPT MASK
0026' D326         OUT      PIOACR ;OUTPUT INTERRUPT MASK
0028' 3EFO         MVI      A,OF0H ;GET PIO B DATA DATA WORD
002A' D325         OUT      PIOBDR ;OUTPUT PIO B DATA WORD
002C' 3E0F         MVI      A,OFH ;GET PIO B MODE WORD (MODE 0)
002E' D327         OUT      PIOBCR ;OUTPUT PIO B MODE WORD
0030' DB20         IN       PORTAD ;CLEAR INPUT PORT A
0032' FB          EI       ;ENABLE INTERRUPTS
0033' 21 0000      LXI      H,0 ;INITIALIZE MEMORY PARITY
0036' 11 0000      LXI      D,0
0039' 01 0000      LXI      B,0
003C' EDB0         LDIR
003E' 3E30         MVI      A,30H ;GET PIO B DATA BYTE
0040' D325         OUT      PIOBDR ;RELEASE PARITY ERROR RESET
0042' 3E06         MVI      A,AACK ;GET ACK
0044' CD 0AB6      CALL     RELOC[OUTBYT] ;OUTPUT ACK
0047' 21 0AC3      LXI      H,RELOC[REQMSG] ;GET REQUEST MESSAGE
004A' 46          MOV      B,M ;GET MESSAGE LENGTH
004B' CD 0A9D      CALL     RELOC[SND740] ;SEND MESSAGE
004E' 21 0ACF      LXI      H,RELOC[REPMSG] ;GET REPLY MESSAGE BUFFER
0051' 0601         MVI      B,1 ;GET LENGTH OF MESSAGE LENGTH
0053' CD 0AA5      CALL     RELOC[RCV740] ;RECEIVE MESSAGE LENGTH
0056' 2B          DCX      H ;BACK UP TO MESSAGE LENGTH
0057' 46          MOV      B,M ;GET MESSAGE LENGTH
0058' 23          INX      H ;RESTORE MESSAGE BUFFER ADDRESS
0059' 05          DCR      B ;DECREMENT MESSAGE LENGTH
005A' CD 0AA5      CALL     RELOC[RCV740] ;RECEIVE MESSAGE
005D' 3A 0ACF      LDA      RELOC[REPMSG] ;GET REPLY MESSAGE LENGTH
0060' FE0C         CPI      MSGHL+1 ;MESSAGE LENGTH=HEADER LENGTH+1?
0062' 2812         JRZ     ..EOF ;IF SO, CONTINUE
0064' 21 0ADA      LXI      H,RELOC[REPMSG+MSGHL] ;GET DATA ADDRESS
0067' ED5B 0AC1     LDED     RELOC[DMADDR] ;GET DMA ADDRESS
006B' 01 0080      LXI      B,128 ;GET DATA RECORD LENGTH
006E' EDB0         LDIR     ;MOVE DOWNLOAD RECORD INTO DMA ADD
0070' ED53 0AC1     SDED     RELOC[DMADDR] ;UPDATE DMA ADDRESS
0074' 18CC         JMPR     ..SPBL ;CONTINUE
0076' 2B          DCX      H ;BACK UP TO O/S ID
0077' 7E          MOV      A,M ;GET SYSTEM DISK
0078' 21 0B5A      LXI      H,RELOC[OSLOAD] ;GET SLAVE PROCESSOR O/S
007B' 5E          MOV      E,M ;GET O/S LOAD ADDRESS
007C' 23          INX      H
007D' 56          MOV      D,M
007E' 23          INX      H
007F' 4E          MOV      C,M ;GET SLAVE PROCESSOR O/S LENGTH

```

LOD740 - TURBODOS OPERATING SYSTEM INTERMEDIATE BOOTSTAP (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0080' 23          INX          H
0081' 46          MOV          B,M
0082' 09          DAD          B          ;CALC LAST BYTE OF O/S
0083' EB          XCHG         ;O/S LOAD ADDRESS TO HL-REG
0084' 09          DAD          B          ;CALC LAST BYTE LOAD ADDRESS
0085' 2B          DCX          H
0086' EB          XCHG         ;HL=END OF O/S-HL=LAST LOAD ADDRESS
0087' EDB8        LDDR         ;MOVE O/S INTO LOAD ADDRESS
0089' 13          INX          D          ;ADVANCE TO O/S ENTRYPPOINT
008A' 2A 0AC7     LHL         RELOC[SID740] ;GET IMS 740 SOURCE ID
008D' 22 0080     SHLD        TBUF      ;STORE ID IN DEFAULT BUFFER
0090' EB          XCHG         ;O/S ENTRYPPOINT TO HL-REG
0091' E9          PCHL         ;TRANSFER TO SLAVE PROCESSOR O/S

;
0092' F5          PIOISR: PUSH   PSW          ;SAVE AF-REG
0093' DB24        IN          PIOADR      ;GET PIO A DATA REGISTER
0095' CB6F        BIT          PORTC5,A    ;PORT C BIT 5 SET? (IBF)
0097' 2004        JRNZ        ..X         ;IF SO, CONTINUE
0099' 3E15        MVI         A,ANAK      ;ELSE, GET NACK
009B' D320        OUT         PORTAD     ;OUTPUT NACK TO PORT A
009D' F1          ..X: POP      PSW          ;RESTORE AF-REG
009E' FB          EI           ;ENABLE INTERRUPTS
009F' ED4D        RETI         ;DONE

;
00A1' 7E          ;SND740: MOV    A,M          ;GET BYTE FROM MESSAGE
00A2' 23          INX          H
00A3' CD 0AB6     CALL         RELOC[OUTBYT] ;OUTPUT BYTE
00A6' 10F9        DJNZ        SND740     ;CONTINUE
00A8' C9          RET          ;DONE

;
00A9' CD 0AAD     ;RCV740: CALL   RELOC[INBYT] ;INPUT BYTE
00AC' 77          MOV          M,A          ;SAVE BYTE IN MESSAGE
00AD' 23          INX          H
00AE' 10F9        DJNZ        RCV740     ;CONTINUE
00B0' C9          RET          ;DONE

;
00B1' DB24        ;INBYT: IN      PIOADR      ;GET PIO A DATA REGISTER
00B3' CB77        BIT          PORTC7,A    ;PORT C BIT 7 SET? (OBF)
00B5' 20FA        JRNZ        INBYT     ;IF NOT, WAIT
00B7' DB20        IN          PORTAD     ;INPUT BYTE FROM PORT A
00B9' C9          RET          ;DONE

;
00BA' 4F          ;OUTBYT: MOV    C,A          ;SAVE OUTPUT BYTE IN C-REG
00BB' DB24        ..WTL: IN      PIOADR      ;GET PIO A DATA REGISTER
00BD' CB6F        BIT          PORTC5,A    ;PORT C BIT 5 SET? (IBF)
00BF' 20FA        JRNZ        ..WTL     ;IF SO, WAIT
00C1' 79          MOV          A,C          ;GET OUTPUT BYTE
00C2' D320        OUT         PORTAD     ;OUTPUT BYTE TO PORT A
00C4' C9          RET          ;DONE

;
00C5' 0B5A        ;DMADDR: .WORD  RELOC[OSLOAD] ;DMA ADDRESS

;
00C7'            ;REQMSG:                ;DOWNLOAD REQUEST MESSAGE
00C7'            MSGHDR:                ;MESSAGE HEADER

```

LOD740 - TURBODOS OPERATING SYSTEM INTERMEDIATE BOOTSTAP (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

00C7'   0C           MSGLEN: .BYTE   MSGHBL   ;MESSAGE LENGTH
00C8'           DID740::          ;SLAVE PROCESSOR DESTINATION ID
00C8'   0000        MSGDID: .WORD   0         ;MESSAGE DESTINATION ID
00CA'   00         MSGPID: .BYTE   0         ;MESSAGE PROCESS ID
00CB'           SID740::          ;SLAVE PROCESSOR SOURCE ID
00CB'   0000        MSGSID: .WORD   0         ;MESSAGE SOURCE ID
00CD'           ORG740::          ;SLAVE PROCESSOR ORIGIN
00CD'   000000     MSGORG: .BYTE   [3]0      ;MESSAGE ORIGIN
00D0'   00         MSGLVL: .BYTE   0         ;MESSAGE LEVEL
00D1'   00         MSGFCD: .BYTE   0         ;MESSAGE FORMAT CODE
;
000B           MSGHL   = .-MSGHDR          ;MESSAGE HEADER LENGTH
;
00D2'   20         SSL740::.BYTE   AS°      ;SLAVE PROCESSOR O/S SUFFIX LETTER
;
000C           MSGHBL = .-MSGHDR          ;MESSAGE HEADER/BUFFER LENGTH
;
00CF           SPBLN  = .-SPB740          ;SLAVE PROCESSOR BOOT CODE LENGTH
;
00D3'           REPMSG: .BLKB   MSGHL+128  ;REPLY MESSAGE BUFFER
;
015E'           OSLOAD = .                ;O/S LOAD ADDRESS
;
.END

```

CKTSER - TURBODOS OPERATING SYSTEM CIRCUIT DRIVER (SERIAL ASYNC)
 COPYRIGHT (C) 1982. SOFTWARE 2000, INC.

```

; *****
; *
; * This is a trivial network circuit driver which
; * may be used for master-to-master networking over
; * an ordinary RS232 serial channel. It performs
; * absolutely no handshaking, error checking, or
; * error recovery, and consequently is suitable only
; * for very short links which are considered to be
; * completely error-free. It could easily be en-
; * hanced to include such features, however.
; *
; *****
;
; COPYRIGHT (C) 1982. SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT CKTSER          ;MODULE ID
;
; INSERT DREQUATE      ;DRIVER SYMBOLIC EQUIVALENCES
;
0000"                .LOC    .DATA.# ;LOCATE IN DATA AREA
;
0000"    OF           CKTSBR::.BYTE  OFH    ;NETWORK BAUD RATE
0001"    01           CKTSCH::.BYTE  1      ;NETWORK SERIAL CHANNEL
;
0000:04              .LOC    .INIT.# ;LOCATE IN INITIALIZATION AREA
;
0000:04 1E03         CKTIN%::MVI    E,3    ;E = SET BAUD RATE FCN
0002:04 ED4B 0000"   LBCD    CKTSBR   ;C = BAUD RATE, B = CHANNEL NUMBER
0006:04 C3 0000:05  JMP     SERIAL# ;SET SERIAL CHANNEL BAUD RATE
;
0000'                .LOC    .PROG.# ;LOCATE IN PROGRAM AREA
;
0000'    79           CKTDR%::MOV    A,C    ;GET FUNCTION NUMBER
0001'    B7           ORA     A          ;FUNCTION NUMBER=0?
0002'    2804        JRZ     RCVMMSG   ;IF SO, CONTINUE
0004'    3D           DCR     A          ;FUNCTION NUMBER=1?
0005'    282E        JRZ     SNDMSG    ;IF SO, CONTINUE
0007'    C9           RET              ;ELSE, DONE
;
0008'    EB           RCVMMSG: XCHG     ;ADDRESS OF BUFFER IN HL-REGISTERS
0009'    0603        ..L1: MVI    B,3    ;LOOK FOR THREE SYNC CHARACTERS
000B'    CD 0027'    ..L2: CALL    RCVA   ;RECEIVE SYNC BYTE (?)
000E'    FE16        CPI     ASYN      ;SYNC?
0010'    20F7        JRNZ    ..L1     ;NO, RESET COUNT
0012'    10F7        DJNZ    ..L2     ;ELSE, CONTINUE FOR COUNT
0014'    23         INX     H          ;ADVANCE PAST BUFFER LINKAGE
0015'    23         INX     H
0016'    23         INX     H
    
```

CKTSER - TURBODOS OPERATING SYSTEM CIRCUIT DRIVER (SERIAL ASYNC)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0017' 23          INX      H
0018' CD 0027'   CALL     RCVA    ;RECEIVE MESSAGE LENGTH BYTE
001B' 47          MOV      B,A    ;B = ACTUAL MESSAGE LENGTH
001C' 1803       JMPR     ..L4   ;JOIN COMMON
001E' CD 0027'   ..L3:  CALL     RCVA    ;RECEIVE MESSAGE BYTE
0021' 77          ..L4:  MOV      M,A    ;STORE IN BUFFER
0022' 23          INX      H        ;INCREMENT BUFFER POINTER
0023' 10F9       DJNZ     ..L3   ;CONTINUE FOR THE COUNT
0025' AF         XRA      A        ;SET RETURN CODE = SUCCESS
0026' C9         RET        ;DONE

;
0027' E5          ;RCVA:  PUSH     H        ;SAVE REGISTERS
0028' C5          PUSH     B
0029' 3A 0001"   LDA      CKTSC  ;B = GET CHANNEL NUMBER
002C' 47          MOV      B,A
002D' 1E01       MVI      E,1    ;E = SERIAL IN FCN
002F' CD 0000:05 CALL     SERIAL# ;INPUT CHARACTER
0032' C1         POP      B        ;RESTORE REGISTERS
0033' E1         POP      H
0034' C9         RET        ;DONE

;
0035' EB          ;SNDMSG: XCHG     ;ADDRESS OF BUFFER IN HL-REGISTERS
0036' 01 0316   LXI      B,3<8!ASYN ;SEND THREE SYNC CHARACTERS FI

T
0039' CD 004C'   ..L1:  CALL     SNDC
003C' 10FB       DJNZ     ..L1
003E' 23         INX      H        ;ADVANCE PAST BUFFER LINKAGE
003F' 23         INX      H
0040' 23         INX      H
0041' 23         INX      H
0042' 46         MOV      B,M    ;B = MESSAGE LENGTH
0043' 4E          ..L2:  MOV      C,M    ;GET NEXT MESSAGE BYTE
0044' 23         INX      H        ;ADVANCE BUFFER POINTER
0045' CD 004C'   CALL     SNDC    ;SEND MESSAGE BYTE
0048' 10F9       DJNZ     ..L2   ;CONTINUE FOR THE COUNT
004A' AF         XRA      A        ;SET RETURN CODE = SUCCESS
004B' C9         RET        ;DONE

;
004C' E5          ;SND:   PUSH     H        ;SAVE REGISTERS
004D' C5          PUSH     B
004E' 3A 0001"   LDA      CKTSC  ;B = GET CHANNEL NUMBER
0051' 47          MOV      B,A
0052' 1E02       MVI      E,2    ;E = SERIAL OUT FCN
0054' CD 0000:05 CALL     SERIAL# ;OUTPUT CHARACTER
0057' C1         POP      B        ;RESTORE REGISTERS
0058' E1         POP      H
0059' C9         RET        ;DONE

;
.END

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

; *****
; *
; * This module handles all serial and parallel I/O
; * for the IMS 442 I/O board. Serial channels 0 and
; * 1 are handled directly by this module, and cor-
; * respond to the two serial ports on the IMS 442
; * board. Serial channels 2, 3, 4 and 5 are passed
; * to another module, SER480, and correspond to the
; * four serial ports on the IMS 480 four-channel
; * serial board. Thus, six serial channels can be
; * supported if both boards are installed.
; *
; * Serial input is handled via interrupts and buf-
; * fered in a separate circular buffer for each chan-
; * nel. Serial output is handled on a polled basis
; * and is not buffered.
; *
; *****
;
; COPYRIGHT (C) 1982. SOFTWARE 2000. INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT SPD442          ;MODULE ID
;
; .INSERT DREQUATE      ;DRIVER SYMBOLIC EQUIVALENCES
;
0010 IOBASE = 10H          ;SERIAL/PARALLEL I/O PORT BASE
;
0010 SOCTRL = IOBASE+00H ;SERIAL 0 CONTROL/STATUS REGISTER
0011 SODATA = IOBASE+01H ;SERIAL 0 DATA REGISTER
0012 S1CTRL = IOBASE+02H ;SERIAL 1 CONTROL/STATUS REGISTER
0013 S1DATA = IOBASE+03H ;SERIAL 1 DATA REGISTER
0014 TIMO   = IOBASE+04H ;TIMER 0 DATA REGISTER
0015 TIM1   = IOBASE+05H ;TIMER 1 DATA REGISTER
0016 TIM2   = IOBASE+06H ;TIMER 2 DATA REGISTER
0017 TIMCTL = IOBASE+07H ;TIMER CONTROL REGISTER
0018 SINTE  = IOBASE+08H ;SERIAL INTERRUPT ENABLE REGISTER
0019 T2RES  = IOBASE+09H ;TIMER 2 INTERRUPT RESET
001C PODATA = IOBASE+0CH ;PARALLEL 0 DATA REGISTER
001D P1DATA = IOBASE+0DH ;PARALLEL 1 DATA REGISTER
001E P2DATA = IOBASE+0EH ;PARALLEL 2 DATA REGISTER
001F PPCTL  = IOBASE+0FH ;PARALLEL PORT CONTROL REGISTER
;
0000 RDA     = 0          ;RECEIVED DATA AVAILABLE BIT
0001 TBE     = 1          ;TRANSMIT BUFFER EMPTY BIT
0007 CTSN    = 7          ;CLEAR TO SEND (NOT) BIT
;
0000 ROMDIS = 0          ;ROM DISABLE BIT
0001 RTCENA = 1          ;REAL TIME CLOCK ENABLE BIT

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0002          S1TXIE = 2          ;SERIAL 1 TX INTERRUPT ENABLE BIT
0003          S1RXIE = 3          ;SERIAL 1 RX INTERRUPT ENABLE BIT
0004          S1RTSN = 4          ;SERIAL 1 REQ TO SEND (NOT) BIT
0005          S0TXIE = 5          ;SERIAL 0 TX INTERRUPT ENABLE BIT
0006          S0RXIE = 6          ;SERIAL 0 RX INTERRUPT ENABLE BIT
0007          S0RTSN = 7          ;SERIAL 0 REQ TO SEND (NOT) BIT
          ;
0036          T0CMD = 36H         ;TIMER 0 COMMAND
0076          T1CMD = 76H         ;TIMER 1 COMMAND
00B6          T2CMD = 0B6H        ;TIMER 2 COMMAND
          ;
0089          PPMODE = 89H        ;PARALLEL PORT MODE WORD
0019          SPMODE = 19H        ;SERIAL PORT MODE WORD
          ;PARITY INHIBIT/1 STOP BIT/8 BITS
          ;
0000"         ;          .LOC    .DATA.# ;LOCATE IN DATA AREA
          ;
0000" 0040    SOIBSZ: .WORD    64    ;SERIAL 0 INPUT BUFFER SIZE
0002" 0000    SOIBUF: .WORD    0     ;SERIAL 0 INPUT BUFFER ADDRESS
0004" 0000    SOIPTR: .WORD    0     ;SERIAL 0 INPUT POINTER
0006" 0000    SOOPTR: .WORD    0     ;SERIAL 0 OUTPUT POINTER
0008" 0000    SOICNT: .WORD    0     ;SERIAL 0 INPUT COUNT
000A" 00      SOOCHR: .BYTE    0     ;SERIAL 0 OUTPUT CHARACTER
000B" 00      SOBR:  .BYTE    0     ;SERIAL 0 BAUD RATE CODE
          ;
000C"         SOISPH:          ;SERIAL 0 INPUT SEMAPHORE
000C" 0000    ..SOIH: .WORD    0     ;SEMAPHORE COUNT
000E" 000E"    ..SOIH: .WORD    ..SOIH ;SEMAPHORE P/D HEAD
0010" 000E"    ..SOIH: .WORD    ..SOIH
          ;
0012" 0000    SOOSPH: .WORD    0     ;SERIAL 0 OUTPUT SEMAPHORE
0014" 0014"    ..SOOH: .WORD    ..SOOH ;SEMAPHORE COUNT
0016" 0014"    ..SOOH: .WORD    ..SOOH ;SEMAPHORE P/D HEAD
          ;
0018" 0001    SOXSPH: .WORD    1     ;SERIAL 0 OUTPUT SEMAPHORE
001A" 001A"    ..SOXH: .WORD    ..SOXH ;SEMAPHORE COUNT
001C" 001A"    ..SOXH: .WORD    ..SOXH ;SEMAPHORE P/D HEAD
          ;
001E" 0010    S1IBSZ: .WORD    16    ;SERIAL 1 INPUT BUFFER SIZE
0020" 0000    S1IBUF: .WORD    0     ;SERIAL 1 INPUT BUFFER ADDRESS
0022" 0000    S1IPTR: .WORD    0     ;SERIAL 1 INPUT POINTER
0024" 0000    S1OPTR: .WORD    0     ;SERIAL 1 OUTPUT POINTER
0026" 0000    S1ICNT: .WORD    0     ;SERIAL 1 INPUT COUNT
0028" 00      S1OCHR: .BYTE    0     ;SERIAL 1 OUTPUT CHARACTER
0029" 00      S1BR:  .BYTE    0     ;SERIAL 1 BAUD RATE CODE
          ;
002A" 0000    S1ISPH: .WORD    0     ;SERIAL 1 INPUT SEMAPHORE
002C" 002C"    ..S1IH: .WORD    ..S1IH ;SEMAPHORE COUNT
002E" 002C"    ..S1IH: .WORD    ..S1IH ;SEMAPHORE P/D HEAD
          ;
          ;SERIAL 1 OUTPUT SEMAPHORE

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0030" 0000          S1OSPH: .WORD 0          ;SEMAPHORE COUNT
0032" 0032"        ..S1OH: .WORD ..S1OH    ;SEMAPHORE P/D HEAD
0034" 0032"        .WORD ..S1OH
;
;SERIAL 1 OUTPUT SEMAPHORE
0036" 0001          S1XSPH: .WORD 1          ;SEMAPHORE COUNT
0038" 0038"        ..S1XH: .WORD ..S1XH    ;SEMAPHORE P/D HEAD
003A" 0038"        .WORD ..S1XH
;
003C" 49           INTMSK: .BYTE 1<ROMDIS!1<SORXIE!1<S1RXIE ;INTERRUPT MAS
;
0000:04           .LOC .INIT.# ;LOCATE IN INITIALIZATION AREA
;
0000:04 3E89       SPINIT: .MVI A,PPMODE ;INITIALIZE 8255
0002:04 D31F       OUT PPCTL
0004:04 3EFF       MVI A,OFFH ;CLEAR PARALLEL PORTS
0006:04 D31C       OUT PODATA
0008:04 D31D       OUT P1DATA
000A:04 3E19       MVI A,SPMODE ;INITIALIZE UARTS
000C:04 D310       OUT SOCTRL
000E:04 D312       OUT S1CTRL
0010:04 3EC3       MVI A,JMP ;SET UP SERIAL INTERRUPT VECTOR
0012:04 32 0018    STA 3*8
0015:04 21 0131'   LXI H,SERISR
0018:04 22 0019    SHLD (3*8)+1
001B:04 3A 003C"   LDA INTMSK ;GET INTERRUPT MASK
001E:04 D318       OUT SINTE ;ENABLE INTERRUPT MASKS
0020:04 2A 0000"   LHLD SOIBSZ ;GET SERIAL 0 INPUT BUFFER SIZE
0023:04 CD 0000:05 CALL ALLOC# ;ALLOCATE PACKET FOR SERIAL BUFFER
0026:04 22 0002"   SHLD SOIBUF ;SAVE SERIAL 0 INPUT BUFFER ADDRES
0029:04 22 0004"   SHLD SOIPTR ;SET SERIAL 0 INPUT POINTER
002C:04 22 0006"   SHLD SOOPTR ;SET SERIAL 0 OUTPUT POINTER
002F:04 2A 001E"   LHLD S1IBSZ ;GET SERIAL 1 INPUT BUFFER SIZE
0032:04 CD 0000:05 CALL ALLOC# ;ALLOCATE PACKET FOR SERIAL BUFFER
0035:04 22 0020"   SHLD S1IBUF ;SAVE SERIAL 1 INPUT BUFFER ADDRES
0038:04 22 0022"   SHLD S1IPTR ;SET SERIAL 1 INPUT POINTER
003B:04 22 0024"   SHLD S1OPTR ;SET SERIAL 1 OUTPUT POINTER
003E:04 C3 0000:06 JMP NIT480# ;INITIALIZE IMS 480 SERIAL PORTS
;
0000'           .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000'           SERIAL:
0000' 7B          COMDRV: .MOV A,E ;GET FUNCTION NUMBER
0001' B7          ORA A ;FUNCTION NUMBER=0?
0002' 2818       JRZ SERST ;IF SO, CONTINUE
0004' 3D          DCR A ;FUNCTION NUMBER=1?
0005' 2834       JRZ SERIN ;IF SO, CONTINUE
0007' 3D          DCR A ;FUNCTION NUMBER=2?
0008' CA 00A4'   JZ SEROUT ;IF SO, CONTINUE
000B' 3D          DCR A ;FUNCTION NUMBER=3?
000C' CA 0200'   JZ SERSBR ;IF SO, CONTINUE
000F' 3D          DCR A ;FUNCTION NUMBER=4?
0010' CA 0235'   JZ SERRBR ;IF SO, CONTINUE
0013' 3D          DCR A ;FUNCTION NUMBER=5?

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0014' CA 0246'      JZ      SERSMC  ;IF SO, CONTINUE
0017' 3D           DCR      A          ;FUNCTION NUMBER=6?
0018' CA 026A'     JZ      SERRMC  ;IF SO, CONTINUE
001B' C9          RET      ;ELSE, DONE

;
001C' 78           ;SERST: MOV     A,B      ;GET CHANNEL NUMBER
001D' FE02        CPI      2          ;CHANNEL NUMBER=0/1?
001F' D2 0000:07 JNC     ST480#  ;IF NOT, CONTINUE

;
0022' ED5B 0008"  ;ST442: LDED   SOICNT  ;GET SERIAL 0 INPUT BUFFER COUNT
0026' 2A 0006"   LHL    SOOPTR  ;GET SERIAL 0 OUTPUT POINTER
0029' 78         MOV     A,B      ;GET CHANNEL NUMBER
002A' B7         ORA     A          ;CHANNEL NUMBER=0
002B' 2807       JRZ     ..STC    ;IF SO, CONTINUE
002D' ED5B 0026" LDED   S1ICNT  ;GET SERIAL 1 INPUT BUFFER COUNT
0031' 2A 0024"   LHL    S1OPTR  ;GET SERIAL 1 OUTPUT POINTER
0034' 7A         ..STC: MOV     A,D
0035' B3         ORA     E          ;SERIAL INPUT BUFFER COUNT=0?
0036' C8         RZ          ;IF SO, DONE
0037' 3EFF       MVI     A,OFFH    ;ELSE, SET RETURN CODE=OFFH
0039' 4E         MOV     C,M      ;GET SERIAL INPUT CHARACTER
003A' C9         RET      ;DONE

;
003B' 78           ;SERIN: MOV     A,B      ;GET CHANNEL NUMBER
003C' FE02        CPI      2          ;CHANNEL NUMBER=0/1?
003E' D2 0000:08 JNC     IN480#  ;IF NOT, CONTINUE
0041' CD 0022'   ..SINL: CALL   ST442  ;ELSE, GET SERIAL STATUS
0044' B7         ORA     A          ;CHARACTER AVAILABLE?
0045' 200F       JRNZ   ..SIN    ;IF SO, CONTINUE
0047' 78         MOV     A,B      ;ELSE, GET CHANNEL NUMBER
0048' 21 000C"   LXI     H,SOISPH ;GET SERIAL 0 INPUT SEMAPHORE
004B' B7         ORA     A          ;CHANNEL NUMBER=0?
004C' 2803       JRZ     ..INC    ;IF SO, CONTINUE
004E' 21 002A"   LXI     H,S1ISPH ;GET SERIAL 1 INPUT SEMAPHORE
0051' CD 0000:09 ..INC: CALL   WAIT#  ;WAIT FOR CONSOLE INPUT
0054' 18EB       JMPR   ..SINL   ;CONTINUE
0056' 78         ..SIN: MOV     A,B      ;GET CHANNEL NUMBER
0057' B7         ORA     A          ;CHANNEL NUMBER=0?
0058' 2025       JRNZ   ..S1I    ;IF NOT, CONTINUE
005A' F3         DI          ;ELSE, DISABLE INTERRUPTS
005B' 2A 0008"   LHL    SOICNT  ;GET SERIAL 0 INPUT COUNT
005E' 2B         DCX     H          ;DECREMENT SERIAL 0 INPUT COUNT
005F' 22 0008"   SHLD  SOICNT  ;UPDATE SERIAL 0 INPUT COUNT
0062' 2A 0006"   LHL    SOOPTR  ;GET SERIAL 0 OUTPUT POINTER
0065' 7E         MOV     A,M      ;GET CHARACTER FROM BUFFER
0066' 23         INX     H          ;INCREMENT SERIAL 0 OUTPUT POINTER
0067' EB         XCHG   ;SERIAL 0 OUTPUT POINTER TO DE-REG
0068' 2A 0002"   LHL    SOIBUF  ;GET SERIAL 0 INPUT BUFFER ADDRESS
006B' ED4B 0000" LBCD   SOIBSZ  ;GET SERIAL 0 INPUT BUFFER SIZE
006F' 0B         DCX     B          ;DECREMENT INPUT BUFFER SIZE
0070' 09         DAD     B          ;CALC LAST INPUT BUFFER ADDRESS
0071' ED52        DSBC   D          ;BUFFER WRAP-AROUND?
0073' 3004       JRNC   ..NWA0  ;IF NOT, CONTINUE
0075' ED5B 0002" LDED   SOIBUF  ;GET SERIAL 0 INPUT BUFFER ADDRESS

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0079' ED53 0006" ..NWA0: SDED SOOPTR ;UPDATE SERIAL 0 OUTPUT POINTER
007D' FB EI ;ENABLE INTERRUPTS
007E' C9 RET ;DONE
007F' F3 ..S1I: DI ;DISABLE INTERRUPTS
0080' 2A 0026" LHL D S1ICNT ;GET SERIAL 1 INPUT COUNT
0083' 2B DCX H ;DECREMENT SERIAL 1 INPUT COUNT
0084' 22 0026" SHLD S1ICNT ;UPDATE SERIAL 1 INPUT COUNT
0087' 2A 0024" LHL D S1OPTR ;GET SERIAL 1 OUTPUT POINTER
008A' 7E MOV A,M ;GET CHARACTER FROM BUFFER
008B' 23 INX H ;INCREMENT SERIAL 1 OUTPUT POINTER
008C' EB XCHG ;SERIAL 1 OUTPUT POINTER TO DE-REG
008D' 2A 0020" LHL D S1IBUF ;GET SERIAL 1 INPUT BUFFER ADDRESS
0090' ED4B 001E" LBCD S1IBSZ ;GET SERIAL 1 INPUT BUFFER SIZE
0094' 0B DCX B ;DECREMENT INPUT BUFFER SIZE
0095' 09 DAD B ;CALC LAST INPUT BUFFER ADDRESS
0096' ED52 DSBC D ;BUFFER WRAP-AROUND?
0098' 3004 JRNC ..NWA1 ;IF NOT, CONTINUE
009A' ED5B 0020" LDED S1IBUF ;GET SERIAL 1 INPUT BUFFER ADDRESS
009E' ED53 0024" ..NWA1: SDED S1OPTR ;UPDATE SERIAL 1 OUTPUT POINTER
00A2' FB EI ;ENABLE INTERRUPTS
00A3' C9 RET ;DONE

;
00A4' 78 ;SEROUT: MOV A,B ;GET CHANNEL NUMBER
00A5' FE02 CPI 2 ;CHANNEL NUMBER=0/1?
00A7' D2 0000:0A JNC OUT480# ;IF NOT, CONTINUE
00AA' B7 ORA A ;CHANNEL NUMBER=1?
00AB' 201E JRNZ ..S10 ;IF SO, CONTINUE
00AD' 21 0018" LXI H,SOXSPH ;GET SERIAL 0 OUT SEMAPHORE
00B0' E5 PUSH H ;SAVE SERIAL 0 OUT SEMAPHORE
00B1' CD 0000:09 CALL WAIT# ;WAIT ON MUTUAL EXCLUSION
00B4' 21 000A" LXI H,SOOCHR ;GET SERIAL 0 OUTPUT CHARACTER
00B7' 71 MOV M,C ;SAVE OUTPUT CHARACTER
00B8' 11 00E9' LXI D,SOOPOL ;GET SERIAL 0 OUT POLL ROUTINE
00BB' CD 0000:0B CALL LNKPOL# ;CREATE POLL ROUTINE
00BE' CD 00ED' CALL SOOPR ;EXECUTE POLL ROUTINE
00C1' 21 0012" LXI H,SOOSPH ;GET SERIAL 0 OUT SEMAPHORE
00C4' CD 0000:09 CALL WAIT# ;DISPATCH IF NECESSARY
00C7' E1 POP H ;GET MUTUAL EXCLUSION SEMAPHORE
00C8' C3 0000:0C JMP SIGNAL# ;SIGNAL PROCESS AS READY
00CB' 21 0036" ..S10: LXI H,S1XSPH ;GET MUTUAL EXCLUSION SEMAPHORE
00CE' E5 PUSH H ;SAVE MUTUAL EXCLUSION SEMAPHORE
00CF' CD 0000:09 CALL WAIT# ;WAIT ON MUTUAL EXCLUSION
00D2' 21 0028" LXI H,S1OCHR ;GET SERIAL 1 OUTPUT CHARACTER
00D5' 71 MOV M,C ;SAVE OUTPUT CHARACTER
00D6' 11 010D' LXI D,S1OPOL ;GET SERIAL 1 OUT POLL ROUTINE
00D9' CD 0000:0B CALL LNKPOL# ;CREATE POLL ROUTINE
00DC' CD 0111' CALL S1OPR ;EXECUTE POLL ROUTINE
00DF' 21 0030" LXI H,S1OSPH ;GET SERIAL 1 OUT SEMAPHORE
00E2' CD 0000:09 CALL WAIT# ;DISPATCH IF NECESSARY
00E5' E1 POP H ;GET MUTUAL EXCLUSION SEMAPHORE
00E6' C3 0000:0C JMP SIGNAL# ;SIGNAL PROCESS AS READY

;
00E9' ;SOOPOL: ;SERIAL 0 OUTPUT POLL ROUTINE
00E9' 0000 .WORD 0 ;SUCCESSOR LINK POINTER

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982. SOFTWARE 2000, INC.

```

00EB' 0000 .WORD 0 ;PREDECESSOR LINK POINTER
;
00ED' DB10 ;SOOPR: IN SOCTRL ;GET SERIAL 0 STATUS
00EF' CB4F BIT TBE,A ;TRANSMIT BUFFER EMPTY?
00F1' C8 RZ ;IF NOT, DONE
00F2' 21 000B" LXI H,SOBR ;ELSE, GET SERIAL 0 BAUD RATE CODE
00F5' CB76 BIT 6,M ;CTS HANDSHAKING REQUESTED?
00F7' 2803 JRZ ..NCTS ;IF NOT, CONTINUE
00F9' CB7F BIT CTSN,A ;CHECK CLEAR TO SEND (NOT) STATUS
00FB' C0 RNZ ;IF CLEAR TO SEND FALSE, DONE
00FC' 3A 000A" ..NCTS: LDA SOOCHR ;GET SERIAL 0 OUTPUT CHARACTER
00FF' D311 OUT SODATA ;OUTPUT CHARACTER
0101' 21 00E9' LXI H,SOOPOL ;GET SERIAL 0 OUT POLL ROUTINE
0104' CD 0000:0D CALL UNLINK# ;UNLINK POLL ROUTINE
0107' 21 0012" LXI H,SOOSPH ;GET SERIAL 0 OUT SEMAPHORE
010A' C3 0000:0C JMP SIGNAL# ;SIGNAL PROCESS AS READY
;
010D' ;S1OPOL: ;SERIAL 1 OUTPUT POLL ROUTINE
010D' 0000 .WORD 0 ;SUCCESSOR LINK POINTER
010F' 0000 .WORD 0 ;PREDECESSOR LINK POINTER
;
0111' DB12 ;S1OPR: IN S1CTRL ;GET SERIAL 1 STATUS
0113' CB4F BIT TBE,A ;TRANSMIT BUFFER EMPTY?
0115' C8 RZ ;IF NOT, DONE
0116' 21 0029" LXI H,S1BR ;ELSE, GET SERIAL 1 BAUD RATE CODE
0119' CB76 BIT 6,M ;CTS HANDSHAKING REQUESTED?
011B' 2803 JRZ ..NCTS ;IF NOT, CONTINUE
011D' CB7F BIT CTSN,A ;CHECK CLEAR TO SEND (NOT) STATUS
011F' C0 RNZ ;IF CLEAR TO SEND FALSE, DONE
0120' 3A 0028" ..NCTS: LDA S1OCHR ;GET SERIAL 1 OUTPUT CHARACTER
0123' D313 OUT S1DATA ;OUTPUT CHARACTER
0125' 21 010D' LXI H,S1OPOL ;GET SERIAL 1 OUT POLL ROUTINE
0128' CD 0000:0D CALL UNLINK# ;UNLINK POLL ROUTINE
012B' 21 0030" LXI H,S1OSPH ;GET SERIAL 1 OUT SEMAPHORE
012E' C3 0000:0C JMP SIGNAL# ;SIGNAL PROCESS AS READY
;
0131' ED73 0000:0E ;SERISR: SSPD INTSP# ;SAVE STACK POINTER
0135' 31 0000:0F LXI SP,INTSTK# ;SET UP AUX STACK POINTER
0138' F5 PUSH PSW ;SAVE REGISTERS
0139' C5 PUSH B
013A' D5 PUSH D
013B' E5 PUSH H
013C' CD 0150' CALL ..SOI ;CHECK FOR SERIAL 0 INPUT
013F' CD 01A6' CALL ..S1I ;CHECK FOR SERIAL 1 INPUT
0142' CD 0000:10 CALL ISR480# ;CHECK FOR IMS 480 INPUT
0145' E1 POP H ;RESTORE REGISTERS
0146' D1 POP D
0147' C1 POP B
0148' F1 POP PSW
0149' ED7B 0000:0E LSPD INTSP# ;RESTORE STACK POINTER
014D' C3 0000:11 JMP ISRXIT# ;CONTINUE
0150' DB10 ..SOI: IN SOCTRL ;GET SERIAL 0 STATUS
0152' CB4F BIT RDA,A ;CHARACTER AVAILABLE
0154' C8 RZ ;IF NOT, DONE

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0155'   DB11           IN      SODATA   ;ELSE, GET SERIAL 0 DATA CHARACTER
0157'   21 000B"      LXI      H,SOBR   ;GET SERIAL 0 BAUD RATE CODE
015A'   CB6E          BIT      5,M      ;INHIBIT INPUT FLAG SET?
015C'   C0            RNZ          ;IF SO, DONE
015D'   4F           MOV      C,A      ;SERIAL 0 DATA CHARACTER TO C-REG
015E'   CB7E          BIT      7,M      ;ATTENTION DETECTION FLAG SET?
0160'   2814          JRZ      ..NADO   ;IF NOT, CONTINUE
0162'   CBB9          RES      7,C      ;STRIP SIGN BIT ON INPUT CHARACTER
0164'   3A 0000:12    LDA      ATNCHR# ;GET ATTENTION CHARACTER
0167'   B9           CMP      C        ;CHARACTER=ATTENTION CHARACTER?
0168'   200C          JRNZ      ..NADO   ;IF NOT, CONTINUE
016A'   2A 0004"      LHL      SOIPTR  ;ELSE, GET SERIAL 0 INPUT POINTER
016D'   22 0006"      SHLD     SOOPTR  ;RESET SERIAL 0 OUTPUT POINTER
0170'   21 0000      LXI      H,0
0173'   22 0008"      SHLD     SOICNT  ;SET SERIAL 0 INPUT COUNT=0
0176'   2A 0000"      ..NADO: LHL      SOIBSZ  ;GET SERIAL 0 INPUT BUFFER SIZE
0179'   ED5B 0008"    LDED     SOICNT  ;GET SERIAL 0 INPUT COUNT
017D'   13           INX      D        ;INCREMENT SERIAL 0 INPUT COUNT
017E'   B7           ORA      A        ;CLEAR CARRY FLAG
017F'   ED52          DSBC     D        ;SERIAL 0 INPUT BUFFER FULL?
0181'   D8           RC          ;IF SO, DONE
0182'   ED53 0008"    SDED     SOICNT  ;ELSE, UPDATE SERIAL 0 INPUT COUNT
0186'   2A 0004"      LHL      SOIPTR  ;GET SERIAL 0 INPUT POINTER
0189'   71           MOV      M,C      ;STORE INPUT CHARACTER IN BUFFER
018A'   23           INX      H        ;INCREMENT INPUT POINTER
018B'   EB           XCHG          ;INPUT BUFFER POINTER TO DE-REG
018C'   2A 0000"      LHL      SOIBSZ  ;GET SERIAL 0 INPUT BUFFER SIZE
018F'   2B           DCX      H        ;DECREMENT INPUT BUFFER SIZE
0190'   ED4B 0002"    LBCD     SOIBUF  ;GET SERIAL 0 INPUT BUFFER ADDRESS
0194'   09           DAD      B        ;CALC LAST INPUT BUFFER ADDRESS
0195'   ED52          DSBC     D        ;BUFFER WRAP-AROUND?
0197'   3004          JRNC     ..NWA0   ;IF NOT, CONTINUE
0199'   ED5B 0002"    LDED     SOIBUF  ;GET SERIAL 0 INPUT BUFFER ADDRESS
019D'   ED53 0004"    ..NWA0: SDED     SOIPTR  ;UPDATE SERIAL 0 INPUT POINTER
01A1'   21 000C"      LXI      H,SOISPH ;GET SERIAL 0 INPUT SEMAPHORE
01A4'   1854          JMPCR   ..X      ;CONTINUE
01A6'   DB12          ..S1I: IN      S1CTRL  ;GET SERIAL 1 STATUS
01A8'   CB47          BIT      RDA,A    ;CHARACTER AVAILABLE
01AA'   C8           RZ          ;IF NOT, DONE
01AB'   DB13          IN      S1DATA  ;ELSE, GET SERIAL 1 DATA CHARACTER
01AD'   21 0029"      LXI      H,S1BR  ;GET SERIAL 1 BAUD RATE CODE
01B0'   CB6E          BIT      5,M      ;INHIBIT INPUT FLAG SET?
01B2'   C0           RNZ          ;IF SO, DONE
01B3'   4F           MOV      C,A      ;SERIAL 1 DATA CHARACTER TO C-REG
01B4'   CB7E          BIT      7,M      ;ATTENTION DETECTION FLAG SET?
01B6'   2814          JRZ      ..NAD1   ;IF NOT, CONTINUE
01B8'   CBB9          RES      7,C      ;STRIP SIGN BIT ON INPUT CHARACTER
01BA'   3A 0000:12    LDA      ATNCHR# ;GET ATTENTION CHARACTER
01BD'   B9           CMP      C        ;CHARACTER=ATTENTION CHARACTER?
01BE'   200C          JRNZ      ..NAD1   ;IF NOT, CONTINUE
01C0'   2A 0022"      LHL      S1IPTR  ;ELSE, GET SERIAL 1 INPUT POINTER
01C3'   22 0024"      SHLD     S1OPTR  ;RESET SERIAL 1 OUTPUT POINTER
01C6'   21 0000      LXI      H,0
01C9'   22 0026"      SHLD     S1ICNT  ;SET SERIAL 1 INPUT COUNT=0

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

01CC' 2A 001E"    ..NAD1: LHL D    S1IBSZ ;GET SERIAL 1 INPUT BUFFER SIZE
01CF' ED5B 0026" LDED    S1ICNT ;GET SERIAL 1 INPUT COUNT
01D3' 13          INX      D      ;INCREMENT SERIAL 1 INPUT COUNT
01D4' B7          ORA      A      ;CLEAR CARRY FLAG
01D5' ED52        DSBC    D      ;SERIAL 1 INPUT BUFFER FULL?
01D7' D8          RC      ;IF SO, DONE
01D8' ED53 0026" SDED    S1ICNT ;ELSE, UPDATE SERIAL 1 INPUT COUNT
01DC' 2A 0022"    LHL D    S1IPTR ;GET SERIAL 1 INPUT POINTER
01DF' 71          MOV     M,C   ;STORE INPUT CHARACTER IN BUFFER
01E0' 23          INX      H      ;INCREMENT INPUT POINTER
01E1' EB          XCHG    ;INPUT BUFFER POINTER TO DE-REG
01E2' 2A 001E"    LHL D    S1IBSZ ;GET SERIAL 1 INPUT BUFFER SIZE
01E5' 2B          DCX     H      ;DECREMENT INPUT BUFFER SIZE
01E6' ED4B 0020" LBCD    S1IBUF ;GET SERIAL 1 INPUT BUFFER ADDRESS
01EA' 09          DAD     B      ;CALC LAST INPUT BUFFER ADDRESS
01EB' ED52        DSBC    D      ;BUFFER WRAP-AROUND?
01ED' 3004        JRNC    ..NWA1 ;IF NOT, CONTINUE
01EF' ED5B 0020" LDED    S1IBUF ;GET SERIAL 1 INPUT BUFFER ADDRESS
01F3' ED53 0022" ..NWA1: S1IPTR ;UPDATE SERIAL 1 INPUT POINTER
01F7' 21 002A"    LXI     H,S1ISPH ;GET SERIAL 1 INPUT SEMAPHORE
01FA' 7E          ..X:  MOV     A,M   ;GET SEMAPHORE COUNT
01FB' B7          ORA      A      ;SEMAPHORE COUNT=0?
01FC' C8          RZ      ;IF SO, DONE
01FD' C3 0000:0C JMP     SIGNAL# ;ELSE, SIGNAL PROCESS AS READY

;
0200' 78          ;SERSBR: MOV    A,B   ;GET CHANNEL NUMBER
0201' FE02        CPI     2     ;CHANNEL NUMBER=0/1?
0203' D2 0000:13 JNC    SBR480# ;IF NOT, CONTINUE
0206' 21 000B"    LXI     H,SOBR ;ELSE, GET SERIAL 0 BAUD RATE CODE
0209' B7          ORA      A      ;CHANNEL NUMBER=0?
020A' 2803        JRZ     ..COM1 ;IF SO, CONTINUE
020C' 21 0029"    LXI     H,S1BR ;ELSE, GET SERIAL 1 BAUD RATE CODE
020F' 71          ..COM1: MOV    M,C   ;SAVE BAUD RATE CODE
0210' CD 0226"    CALL   GETBTV ;GET BAUD RATE TIMER VALUE
0213' 78          MOV     A,B   ;GET CHANNEL NUMBER
0214' B7          ORA      A      ;CHANNEL NUMBER=0?
0215' 3E36        MVI     A,TOCMD ;GET TIMER 0 COMMAND
0217' 0E14        MVI     C,TIMO  ;GET TIMER 0 DATA REGISTER
0219' 2804        JRZ     ..COM2 ;IF CHANNEL NUMBER=0, CONTINUE
021B' 3E76        MVI     A,T1CMD ;ELSE, GET TIMER 1 COMMAND
021D' 0E15        MVI     C,TIM1  ;GET TIMER 1 DATA REGISTER
021F' D317        ..COM2: OUT   TIMCTL ;SELECT TIMER
0221' ED59        OUTP    E      ;OUTPUT LSB OF TIMER VALUE
0223' ED51        OUTP    D      ;OUTPUT MSB OF TIMER VALUE
0225' C9          RET     ;DONE

;
0226' 79          GETBTV: MOV   A,C   ;GET REQUESTED BAUD RATE CODE
0227' E60F        ANI     OFH   ;EXTRACT RELEVANT BITS
0229' 87          ADD     A      ;X2
022A' 5F          MOV     E,A   ;TO E-REG
022B' 1600        MVI     D,0    ;MAKE IT DOUBLE LENGTH
022D' 21 0000:14 LXI     H,BRTBL# ;GET BAUD RATE TABLE
0230' 19          DAD     D      ;INDEX INTO TABLE
0231' 5E          MOV     E,M   ;GET TIMER VALUE

```

SPD442 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL I/O DRIVER (IMS 442)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0232' 23          INX      H
0233' 56          MOV      D,M
0234' C9          RET              ;DONE

;
;SERRBR: MOV      A,B      ;GET CHANNEL NUMBER
0235' 78          CPI      2      ;CHANNEL NUMBER=0/1?
0236' FE02        JNC      RBR480# ;IF NOT, CONTINUE
0238' D2 0000:15 LXI      H,SOBR ;ELSE, GET SERIAL 0 BAUD RATE CODE
023B' 21 000B"   ORA      A      ;CHANNEL NUMBER=0?
023E' B7          JRZ      ..COM ;IF SO, CONTINUE
023F' 2803        LXI      H,S1BR ;ELSE, GET SERIAL 1 BAUD RATE CODE
0241' 21 0029"   ..COM: MOV      A,M      ;GET CURRENT BAUD RATE CODE
0244' 7E          RET              ;DONE
0245' C9

;
;SERSMC: MOV      A,B      ;GET CHANNEL NUMBER
0246' 78          CPI      2      ;CHANNEL NUMBER=0/1?
0247' FE02        JNC      SMC480# ;IF NOT, CONTINUE
0249' D2 0000:16 LXI      H,SOBR ;CHANNEL NUMBER=0?
024C' B7          LDA      INTMSK ;GET INT MASK
024D' 3A 003C"   JRNZ   ..CH1 ;IF CHANNEL NUMBER NOT=0, CONTINUE
0250' 200A        RES      SORTSN,A ;CLEAR SERIAL 0 REQ TO SEND (NOT
0252' CBBF        BIT      7,C      ;SERIAL 0 REQ TO SEND TO BE ON?
0254' CB79        JRNZ   ..COM ;IF SO, CONTINUE
0256' 200C        SET      SORTSN,A ;ELSE, SET SERIAL 0 RTS (NOT)
0258' CBFF        JMPR   ..COM ;CONTINUE
025A' 1808        ..CH1: RES      S1RTSN,A ;CLEAR SERIAL 1 REQ TO SEND (NOT
025C' CBA7        BIT      7,C      ;SERIAL 1 REQ TO SEND TO BE ON?
025E' CB79        JRNZ   ..COM ;IF SO, CONTINUE
0260' 2002        SET      S1RTSN,A ;ELSE, SET SERIAL 1 RTS (NOT)
0262' CBE7        ..COM: STA      INTMSK ;UPDATE INT MASK
0264' 32 003C"   OUT      SINTE ;SET SERIAL 1 REQUEST TO SEND
0267' D318        RET              ;DONE
0269' C9

;
;SERRMC: MOV      A,B      ;GET CHANNEL NUMBER
026A' 78          CPI      2      ;CHANNEL NUMBER=0/1?
026B' FE02        JNC      RMC480# ;IF NOT, CONTINUE
026D' D2 0000:17 LXI      H,S1CTRL ;GET SERIAL 0 STATUS
0270' B7          JRZ      ..COM ;IF CHANNEL NUMBER=0, CONTINUE
0271' DB12        IN      S1CTRL ;ELSE, GET SERIAL 1 STATUS
0273' 2802        ..COM: ANI      1<CTSN ;EXTRACT CLEAR TO SEND (NOT)
0275' DB12        XRI      1<CTSN ;COMPLIMENT IT
0277' E680        RET              ;DONE
0279' EE80
027B' C9

;
;POOUT:: OUT      PODATA ;OUTPUT BYTE TO PARALLEL 0
027C' D31C        RET              ;DONE
027E' C9

;
;P1OUT:: OUT      P1DATA ;OUTPUT BYTE TO PARALLEL 1
027F' D31D        RET              ;DONE
0281' C9

;
;P2IN:: IN      P2DATA ;INPUT BYTE FROM PARALLEL 2
0282' DB1E        RET              ;DONE
0284' C9

;
.END

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

;
; *****
; *
; * This module is called by SPD442, and handles the
; * four serial ports on the IMS 480 four-port serial
; * board. Input is handled on an interrupt-driven
; * basis and buffered via a circular buffer. Output
; * is handled on a polled basis and not buffered.
; *
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT SER480 ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
00E0 ;IOBASE = 0E0H ;I/O PORT BASE
;
00E0 ;S2DATA = IOBASE+00H ;SERIAL 2 DATA REGISTER
00E1 ;S2IER = IOBASE+01H ;SERIAL 2 INTERRUPT ENABLE REGISTE
00E2 ;S2IIDR = IOBASE+02H ;SERIAL 2 INTERRUPT ID REGISTER
00E3 ;S2LCR = IOBASE+03H ;SERIAL 2 LINE CONTROL REGISTER
00E4 ;S2MCR = IOBASE+04H ;SERIAL 2 MODEM CONTROL REGISTER
00E5 ;S2LSR = IOBASE+05H ;SERIAL 2 LINE STATUS REGISTER
00E6 ;S2MSR = IOBASE+06H ;SERIAL 2 MODEM STATUS REGISTER
;
00E8 ;S3DATA = IOBASE+08H ;SERIAL 3 DATA REGISTER
00E9 ;S3IER = IOBASE+09H ;SERIAL 3 INTERRUPT ENABLE REGISTE
00EA ;S3IIDR = IOBASE+0AH ;SERIAL 3 INTERRUPT ID REGISTER
00EB ;S3LCR = IOBASE+0BH ;SERIAL 3 LINE CONTROL REGISTER
00EC ;S3MCR = IOBASE+0CH ;SERIAL 3 MODEM CONTROL REGISTER
00ED ;S3LSR = IOBASE+0DH ;SERIAL 3 LINE STATUS REGISTER
00EE ;S3MSR = IOBASE+0EH ;SERIAL 3 MODEM STATUS REGISTER
;
00F0 ;S4DATA = IOBASE+10H ;SERIAL 4 DATA REGISTER
00F1 ;S4IER = IOBASE+11H ;SERIAL 4 INTERRUPT ENABLE REGISTE
00F2 ;S4IIDR = IOBASE+12H ;SERIAL 4 INTERRUPT ID REGISTER
00F3 ;S4LCR = IOBASE+13H ;SERIAL 4 LINE CONTROL REGISTER
00F4 ;S4MCR = IOBASE+14H ;SERIAL 4 MODEM CONTROL REGISTER
00F5 ;S4LSR = IOBASE+15H ;SERIAL 4 LINE STATUS REGISTER
00F6 ;S4MSR = IOBASE+16H ;SERIAL 4 MODEM STATUS REGISTER
;
00F8 ;S5DATA = IOBASE+18H ;SERIAL 5 DATA REGISTER
00F9 ;S5IER = IOBASE+19H ;SERIAL 5 INTERRUPT ENABLE REGISTE
00FA ;S5IIDR = IOBASE+1AH ;SERIAL 5 INTERRUPT ID REGISTER
00FB ;S5LCR = IOBASE+1BH ;SERIAL 5 LINE CONTROL REGISTER
00FC ;S5MCR = IOBASE+1CH ;SERIAL 5 MODEM CONTROL REGISTER
    
```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

00FD          S5LSR = IOBASE+1DH ;SERIAL 5 LINE STATUS REGISTER
00FE          S5MSR = IOBASE+1EH ;SERIAL 5 MODEM STATUS REGISTER
;
0001          IERCW = 01H ;INT ENABLE REGISTER CONTROL WORD
0003          LCRCW = 03H ;LINE CONTROL REGISTER CONTROL WOR
0003          MCRCW = 03H ;MODEM CONTROL REGISTER CTRL WORD
;
0000          RDA = 0 ;RECEIVED DATA AVAILABLE BIT
0005          TBE = 5 ;TRANSMIT BUFFER EMPTY BIT
0004          CTS = 4 ;CLEAR TO SEND BIT
;
0000"         ; .LOC .DATA.# ;LOCATE IN DATA AREA
;
0000" 0010    S2IBSZ: .WORD 16 ;SERIAL 2 INPUT BUFFER SIZE
0002" 0000    S2IBUF: .WORD 0 ;SERIAL 2 INPUT BUFFER ADDRESS
0004" 0000    S2IPTR: .WORD 0 ;SERIAL 2 INPUT POINTER
0006" 0000    S2OPTR: .WORD 0 ;SERIAL 2 OUTPUT POINTER
0008" 0000    S2ICNT: .WORD 0 ;SERIAL 2 INPUT COUNT
000A" 00      S2OCHR: .BYTE 0 ;SERIAL 2 OUTPUT CHARACTER
000B" 00      S2BR: .BYTE 0 ;SERIAL 2 BAUD RATE CODE
;
000C"         S2ISPH: ;SERIAL 2 INPUT SEMAPHORE
000C" 0000    .WORD 0 ;SEMAPHORE COUNT
000E" 000E"   ..S2IH: .WORD ..S2IH ;SEMAPHORE P/D HEAD
0010" 000E"   .WORD ..S2IH
;
0012" 0000    S2OSPH: .WORD 0 ;SERIAL 2 OUTPUT SEMAPHORE
0014" 0014"   ..S2OH: .WORD ..S2OH ;SEMAPHORE COUNT
0016" 0014"   .WORD ..S2OH ;SEMAPHORE P/D HEAD
;
0018" 0001    S2XSPH: .WORD 1 ;SERIAL 2 OUTPUT SEMAPHORE
001A" 001A"   ..S2XH: .WORD ..S2XH ;SEMAPHORE COUNT
001C" 001A"   .WORD ..S2XH ;SEMAPHORE P/D HEAD
;
001E" 0010    S3IBSZ: .WORD 16 ;SERIAL 3 INPUT BUFFER SIZE
0020" 0000    S3IBUF: .WORD 0 ;SERIAL 3 INPUT BUFFER ADDRESS
0022" 0000    S3IPTR: .WORD 0 ;SERIAL 3 INPUT POINTER
0024" 0000    S3OPTR: .WORD 0 ;SERIAL 3 OUTPUT POINTER
0026" 0000    S3ICNT: .WORD 0 ;SERIAL 3 INPUT COUNT
0028" 00      S3OCHR: .BYTE 0 ;SERIAL 3 OUTPUT CHARACTER
0029" 00      S3BR: .BYTE 0 ;SERIAL 3 BAUD RATE CODE
;
002A" 0000    S3ISPH: .WORD 0 ;SERIAL 3 INPUT SEMAPHORE
002C" 002C"   ..S3IH: .WORD ..S3IH ;SEMAPHORE COUNT
002E" 002C"   .WORD ..S3IH ;SEMAPHORE P/D HEAD
;
0030" 0000    S3OSPH: .WORD 0 ;SERIAL 3 OUTPUT SEMAPHORE
0032" 0032"   ..S3OH: .WORD ..S3OH ;SEMAPHORE COUNT
0034" 0032"   .WORD ..S3OH ;SEMAPHORE P/D HEAD
;

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0036" 0001      S3XSPH: .WORD 1      ;SERIAL 3 OUTPUT SEMAPHORE
0038" 0038"    ..S3XH: .WORD ..S3XH ;SEMAPHORE COUNT
003A" 0038"    .WORD ..S3XH ;SEMAPHORE P/D HEAD
;
003C" 0010      S4IBSZ: .WORD 16     ;SERIAL 4 INPUT BUFFER SIZE
003E" 0000      S4IBUF: .WORD 0      ;SERIAL 4 INPUT BUFFER ADDRESS
0040" 0000      S4IPTR: .WORD 0      ;SERIAL 4 INPUT POINTER
0042" 0000      S4OPTR: .WORD 0      ;SERIAL 4 OUTPUT POINTER
0044" 0000      S4ICNT: .WORD 0      ;SERIAL 4 INPUT COUNT
0046" 00        S4OCHR: .BYTE 0      ;SERIAL 4 OUTPUT CHARACTER
0047" 00        S4BR: .BYTE 0      ;SERIAL 4 BAUD RATE CODE
;
0048"          S4ISPH:          ;SERIAL 4 INPUT SEMAPHORE
0048" 0000      .WORD 0          ;SEMAPHORE COUNT
004A" 004A"    ..S4IH: .WORD ..S4IH ;SEMAPHORE P/D HEAD
004C" 004A"    .WORD ..S4IH
;
004E" 0000      S4OSPH: .WORD 0      ;SERIAL 4 OUTPUT SEMAPHORE
0050" 0050"    ..S4OH: .WORD ..S4OH ;SEMAPHORE COUNT
0052" 0050"    .WORD ..S4OH ;SEMAPHORE P/D HEAD
;
0054" 0001      S4XSPH: .WORD 1      ;SERIAL 4 OUTPUT SEMAPHORE
0056" 0056"    ..S4XH: .WORD ..S4XH ;SEMAPHORE COUNT
0058" 0056"    .WORD ..S4XH ;SEMAPHORE P/D HEAD
;
005A" 0010      S5IBSZ: .WORD 16     ;SERIAL 5 INPUT BUFFER SIZE
005C" 0000      S5IBUF: .WORD 0      ;SERIAL 5 INPUT BUFFER ADDRESS
005E" 0000      S5IPTR: .WORD 0      ;SERIAL 5 INPUT POINTER
0060" 0000      S5OPTR: .WORD 0      ;SERIAL 5 OUTPUT POINTER
0062" 0000      S5ICNT: .WORD 0      ;SERIAL 5 INPUT COUNT
0064" 00        S5OCHR: .BYTE 0      ;SERIAL 5 OUTPUT CHARACTER
0065" 00        S5BR: .BYTE 0      ;SERIAL 5 BAUD RATE CODE
;
0066" 0000      S5ISPH: .WORD 0          ;SERIAL 5 INPUT SEMAPHORE
0068" 0068"    ..S5IH: .WORD ..S5IH ;SEMAPHORE COUNT
006A" 0068"    .WORD ..S5IH ;SEMAPHORE P/D HEAD
;
006C" 0000      S5OSPH: .WORD 0      ;SERIAL 5 OUTPUT SEMAPHORE
006E" 006E"    ..S5OH: .WORD ..S5OH ;SEMAPHORE COUNT
0070" 006E"    .WORD ..S5OH ;SEMAPHORE P/D HEAD
;
0072" 0001      S5XSPH: .WORD 1      ;SERIAL 5 OUTPUT SEMAPHORE
0074" 0074"    ..S5XH: .WORD ..S5XH ;SEMAPHORE COUNT
0076" 0074"    .WORD ..S5XH ;SEMAPHORE P/D HEAD
;
0000:04          .LOC .INIT.# ;LOCATE IN INITIALIZATION AREA

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000, INC.

```

0000:04 3E03          NIT480::MVI    A,LCRCW ;GET LINE CONTROL REGISTER VALUE
0002:04 D3E3          OUT    S2LCR  ;SET LINE CONTROL REGISTER 0
0004:04 D3EB          OUT    S3LCR  ;SET LINE CONTROL REGISTER 1
0006:04 D3F3          OUT    S4LCR  ;SET LINE CONTROL REGISTER 2
0008:04 D3FB          OUT    S5LCR  ;SET LINE CONTROL REGISTER 3
000A:04 3E03          MVI    A,MCRCW ;GET MODEM CONTROL REGISTER VALUE
000C:04 D3E4          OUT    S2MCR  ;SET MODEM CONTROL REGISTER 0
000E:04 D3EC          OUT    S3MCR  ;SET MODEM CONTROL REGISTER 1
0010:04 D3F4          OUT    S4MCR  ;SET MODEM CONTROL REGISTER 2
0012:04 D3FC          OUT    S5MCR  ;SET MODEM CONTROL REGISTER 3
0014:04 3E01          MVI    A,IERCW ;GET INT ENABLE REGISTER VALUE
0016:04 D3E1          OUT    S2IER  ;SET INT ENABLE REGISTER 0
0018:04 D3E9          OUT    S3IER  ;SET INT ENABLE REGISTER 1
001A:04 D3F1          OUT    S4IER  ;SET INT ENABLE REGISTER 2
001C:04 D3F9          OUT    S5IER  ;SET INT ENABLE REGISTER 3
001E:04 2A 0000"    LHLD   S2IBSZ ;GET SERIAL 2 INPUT BUFFER SIZE
0021:04 CD 0000:05  CALL   ALLOC# ;ALLOCATE PACKET FOR SERIAL BUFFER
0024:04 22 0002"    SHLD   S2IBUF ;SAVE SERIAL 2 INPUT BUFFER ADDRES
0027:04 22 0004"    SHLD   S2IPTR ;SET SERIAL 2 INPUT POINTER
002A:04 22 0006"    SHLD   S2OPTR ;SET SERIAL 2 OUTPUT POINTER
002D:04 2A 001E"    LHLD   S3IBSZ ;GET SERIAL 3 INPUT BUFFER SIZE
0030:04 CD 0000:05  CALL   ALLOC# ;ALLOCATE PACKET FOR SERIAL BUFFER
0033:04 22 0020"    SHLD   S3IBUF ;SAVE SERIAL 3 INPUT BUFFER ADDRES
0036:04 22 0022"    SHLD   S3IPTR ;SET SERIAL 3 INPUT POINTER
0039:04 22 0024"    SHLD   S3OPTR ;SET SERIAL 3 OUTPUT POINTER
003C:04 2A 003C"    LHLD   S4IBSZ ;GET SERIAL 4 INPUT BUFFER SIZE
003F:04 CD 0000:05  CALL   ALLOC# ;ALLOCATE PACKET FOR SERIAL BUFFER
0042:04 22 003E"    SHLD   S4IBUF ;SAVE SERIAL 4 INPUT BUFFER ADDRES
0045:04 22 0040"    SHLD   S4IPTR ;SET SERIAL 4 INPUT POINTER
0048:04 22 0042"    SHLD   S4OPTR ;SET SERIAL 4 OUTPUT POINTER
004B:04 2A 005A"    LHLD   S5IBSZ ;GET SERIAL 5 INPUT BUFFER SIZE
004E:04 CD 0000:05  CALL   ALLOC# ;ALLOCATE PACKET FOR SERIAL BUFFER
0051:04 22 005C"    SHLD   S5IBUF ;SAVE SERIAL 5 INPUT BUFFER ADDRES
0054:04 22 005E"    SHLD   S5IPTR ;SET SERIAL 5 INPUT POINTER
0057:04 22 0060"    SHLD   S5OPTR ;SET SERIAL 5 OUTPUT POINTER
005A:04 C9          RET      ;DONE

;
0000'          ; .LOC      .PROG.# ;LOCATE IN PROGRAM AREA

;
0000'          ;ST480:: MOV    A,B      ;GET CHANNEL NUMBER
0001' 78          SUI    2        ;CHANNEL NUMBER=2?
0003' D602       JRZ    ..ST2   ;IF SO, CONTINUE
0005' 2808       DCR    A        ;CHANNEL NUMBER=3?
0006' 3D          JRZ    ..ST3   ;IF SO, CONTINUE
0008' 280E       DCR    A        ;CHANNEL NUMBER=4?
0009' 3D          JRZ    ..ST4   ;IF SO, CONTINUE
000B' 2814       JRZ    ..ST5   ;CONTINUE
000B' 181B       JMPR   ..ST5

;
000D' ED5B 0008" ..ST2: LDED   S2ICNT ;GET SERIAL 2 INPUT BUFFER COUNT
0011' 2A 0006"   LHLD   S2OPTR ;GET SERIAL 2 OUTPUT POINTER
0014' 1819       JMPR   ..COM    ;CONTINUE
0016' ED5B 0026" ..ST3: LDED   S3ICNT ;GET SERIAL 3 INPUT BUFFER COUNT
001A' 2A 0024"   LHLD   S3OPTR ;GET SERIAL 3 OUTPUT POINTER
001D' 1810       JMPR   ..COM    ;CONTINUE

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

001F' ED5B 0044" ..ST4: LDED S4ICNT ;GET SERIAL 4 INPUT BUFFER COUNT
0023' 2A 0042" LHL D S4OPTR ;GET SERIAL 4 OUTPUT POINTER
0026' 1807 JMP R ..COM ;CONTINUE
0028' ED5B 0062" ..ST5: LDED S5ICNT ;GET SERIAL 5 INPUT BUFFER COUNT
002C' 2A 0060" LHL D S5OPTR ;GET SERIAL 5 OUTPUT POINTER
002F' 7A ..COM: MOV A,D
0030' B3 OR A ;SERIAL INPUT BUFFER COUNT=0?
0031' C8 RZ ;IF SO, DONE
0032' 3EFF MVI A,OFFH ;ELSE, SET RETURN CODE=OFFH
0034' 4E MOV C,M ;GET SERIAL INPUT CHARACTER
0035' C9 RET ;DONE

;
0036' CD 0000' ;IN480:: CALL ST480 ;GET SERIAL STATUS
0039' B7 OR A ;CHARACTER AVAILABLE?
003A' 201C JRNZ ..SIN ;IF SO, CONTINUE
003C' 78 MOV A,B ;ELSE, GET CHANNEL NUMBER
003D' 21 000C" LXI H,S2ISPH ;GET SERIAL 2 INPUT SEMAPHORE
0040' D602 SUI 2 ;CHANNEL NUMBER=2?
0042' 280F JRZ ..INC ;IF SO, CONTINUE
0044' 21 002A" LXI H,S3ISPH ;GET SERIAL 3 INPUT SEMAPHORE
0047' 3D DCR A ;CHANNEL NUMBER=3?
0048' 2809 JRZ ..INC ;IF SO, CONTINUE
004A' 21 0048" LXI H,S4ISPH ;GET SERIAL 4 INPUT SEMAPHORE
004D' 3D DCR A ;CHANNEL NUMBER=4?
004E' 2803 JRZ ..INC ;IF SO, CONTINUE
0050' 21 0066" LXI H,S5ISPH ;GET SERIAL 5 INPUT SEMAPHORE

;
0053' CD 0000:06 ..INC: CALL WAIT# ;WAIT FOR INPUT CHARACTER
0056' 18DE JMP R ;CONTINUE
0058' 78 ..SIN: MOV A,B ;GET CHANNEL NUMBER
0059' D602 SUI 2 ;CHANNEL NUMBER=2?
005B' 2808 JRZ ..IN2 ;IF SO, CONTINUE
005D' 3D DCR A ;CHANNEL NUMBER=3?
005E' 282A JRZ ..IN3 ;IF SO, CONTINUE
0060' 3D DCR A ;CHANNEL NUMBER=4?
0061' 284C JRZ ..IN4 ;IF SO, CONTINUE
0063' 186F JMP R ..IN5 ;ELSE, CONTINUE

;
0065' F3 ..IN2: DI ;DISABLE INTERRUPTS
0066' 2A 0008" LHL D S2ICNT ;GET SERIAL 2 INPUT COUNT
0069' 2B DCX H ;DECREMENT SERIAL 2 INPUT COUNT
006A' 22 0008" SHLD S2ICNT ;UPDATE SERIAL 2 INPUT COUNT
006D' 2A 0006" LHL D S2OPTR ;GET SERIAL 2 OUTPUT POINTER
0070' 7E MOV A,M ;GET CHARACTER FROM BUFFER
0071' 23 INX H ;INCREMENT SERIAL 2 OUTPUT POINTER
0072' EB XCHG ;SERIAL 2 OUTPUT POINTER TO DE-REG
0073' 2A 0002" LHL D S2IBUF ;GET SERIAL 2 INPUT BUFFER ADDRESS
0076' ED4B 0000" LBCD S2IBSZ ;GET SERIAL 2 INPUT BUFFER SIZE
007A' 0B DCX B ;DECREMENT INPUT BUFFER SIZE
007B' 09 DAD B ;CALC LAST INPUT BUFFER ADDRESS
007C' ED52 DSBC D ;BUFFER WRAP-AROUND?
007E' 3004 JRNC ..NWA2 ;IF NOT, CONTINUE
0080' ED5B 0002" LDED S2IBUF ;GET SERIAL 2 INPUT BUFFER ADDRESS
0084' ED53 0006" ..NWA2: SDED S2OPTR ;UPDATE SERIAL 2 OUTPUT POINTER

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

0088' FB EI ;ENABLE INTERRUPTS
0089' C9 RET ;DONE

;
008A' F3 ;..IN3: DI ;DISABLE INTERRUPTS
008B' 2A 0026" LHL D S3ICNT ;GET SERIAL 3 INPUT COUNT
008E' 2B DCX H ;DECREMENT SERIAL 3 INPUT COUNT
008F' 22 0026" SHLD S3ICNT ;UPDATE SERIAL 3 INPUT COUNT
0092' 2A 0024" LHL D S3OPTR ;GET SERIAL 3 OUTPUT POINTER
0095' 7E MOV A,M ;GET CHARACTER FROM BUFFER
0096' 23 INX H ;INCREMENT SERIAL 3 OUTPUT POINTER
0097' EB XCHG ;SERIAL 3 OUTPUT POINTER TO DE-REG
0098' 2A 0020" LHL D S3IBUF ;GET SERIAL 3 INPUT BUFFER ADDRESS
009B' ED4B 001E" LBCD S3IBSZ ;GET SERIAL 3 INPUT BUFFER SIZE
009F' 0B DCX B ;DECREMENT INPUT BUFFER SIZE
00A0' 09 DAD B ;CALC LAST INPUT BUFFER ADDRESS
00A1' ED52 DSBC D ;BUFFER WRAP-AROUND?
00A3' 3004 JRNC ..NWA3 ;IF NOT, CONTINUE
00A5' ED5B 0020" LDED S3IBUF ;GET SERIAL 3 INPUT BUFFER ADDRESS
00A9' ED53 0024" ;..NWA3: SDED S3OPTR ;UPDATE SERIAL 3 OUTPUT POINTER
00AD' FB EI ;ENABLE INTERRUPTS
00AE' C9 RET ;DONE

;
00AF' F3 ;..IN4: DI ;DISABLE INTERRUPTS
00B0' 2A 0044" LHL D S4ICNT ;GET SERIAL 4 INPUT COUNT
00B3' 2B DCX H ;DECREMENT SERIAL 4 INPUT COUNT
00B4' 22 0044" SHLD S4ICNT ;UPDATE SERIAL 4 INPUT COUNT
00B7' 2A 0042" LHL D S4OPTR ;GET SERIAL 4 OUTPUT POINTER
00BA' 7E MOV A,M ;GET CHARACTER FROM BUFFER
00BB' 23 INX H ;INCREMENT SERIAL 4 OUTPUT POINTER
00BC' EB XCHG ;SERIAL 4 OUTPUT POINTER TO DE-REG
00BD' 2A 003E" LHL D S4IBUF ;GET SERIAL 4 INPUT BUFFER ADDRESS
00C0' ED4B 003C" LBCD S4IBSZ ;GET SERIAL 4 INPUT BUFFER SIZE
00C4' 0B DCX B ;DECREMENT INPUT BUFFER SIZE
00C5' 09 DAD B ;CALC LAST INPUT BUFFER ADDRESS
00C6' ED52 DSBC D ;BUFFER WRAP-AROUND?
00C8' 3004 JRNC ..NWA4 ;IF NOT, CONTINUE
00CA' ED5B 003E" LDED S4IBUF ;GET SERIAL 4 INPUT BUFFER ADDRESS
00CE' ED53 0042" ;..NWA4: SDED S4OPTR ;UPDATE SERIAL 4 OUTPUT POINTER
00D2' FB EI ;ENABLE INTERRUPTS
00D3' C9 RET ;DONE

;
00D4' F3 ;..IN5: DI ;DISABLE INTERRUPTS
00D5' 2A 0062" LHL D S5ICNT ;GET SERIAL 5 INPUT COUNT
00D8' 2B DCX H ;DECREMENT SERIAL 5 INPUT COUNT
00D9' 22 0062" SHLD S5ICNT ;UPDATE SERIAL 5 INPUT COUNT
00DC' 2A 0060" LHL D S5OPTR ;GET SERIAL 5 OUTPUT POINTER
00DF' 7E MOV A,M ;GET CHARACTER FROM BUFFER
00E0' 23 INX H ;INCREMENT SERIAL 5 OUTPUT POINTER
00E1' EB XCHG ;SERIAL 5 OUTPUT POINTER TO DE-REG
00E2' 2A 005C" LHL D S5IBUF ;GET SERIAL 5 INPUT BUFFER ADDRESS
00E5' ED4B 005A" LBCD S5IBSZ ;GET SERIAL 5 INPUT BUFFER SIZE
00E9' 0B DCX B ;DECREMENT INPUT BUFFER SIZE
00EA' 09 DAD B ;CALC LAST INPUT BUFFER ADDRESS
00EB' ED52 DSBC D ;BUFFER WRAP-AROUND?

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

00ED' 3004          JRNC    ..NWA5 ;IF NOT, CONTINUE
00EF' ED5B 005C"   LDED    S5IBUF ;GET SERIAL 5 INPUT BUFFER ADDRESS
00F3' ED53 0060"   ..NWA5: SDED    S5OPTR ;UPDATE SERIAL 5 OUTPUT POINTER
00F7' FB          EI      ;ENABLE INTERRUPTS
00F8' C9          RET     ;DONE

;
00F9' D602          ;OUT480::SUI 2 ;CHANNEL NUMBER=2?
00FB' 2808          JRZ    ..OUT2 ;IF SO, CONTINUE
00FD' 3D           DCR    A ;CHANNEL NUMBER=3?
00FE' 2823          JRZ    ..OUT3 ;IF SO, CONTINUE
0100' 3D           DCR    A ;CHANNEL NUMBER=4?
0101' 283E          JRZ    ..OUT4 ;IF SO, CONTINUE
0103' 185A          JMPR   ..OUT5 ;ELSE, CONTINUE

;
0105' 21 0018"     ..OUT2: LXI   H,S2XSPH ;GET SERIAL 2 OUT SEMAPHORE
0108' E5           PUSH  H ;SAVE SERIAL 2 OUT SEMAPHORE
0109' CD 0000:06   CALL  WAIT# ;WAIT ON MUTUAL EXCLUSION
010C' 21 000A"     LXI   H,S2OCHR ;GET SERIAL 2 OUTPUT CHARACTER
010F' 71           MOV   M,C ;SAVE OUTPUT CHARACTER
0110' 11 017D'    LXI   D,S2OPOL ;GET SERIAL 2 OUT POLL ROUTINE
0113' CD 0000:07   CALL  LNKPOL# ;CREATE POLL ROUTINE
0116' CD 0181'    CALL  S2OPR ;EXECUTE POLL ROUTINE
0119' 21 0012"     LXI   H,S2OSPH ;GET SERIAL 2 OUT SEMAPHORE
011C' CD 0000:06   CALL  WAIT# ;DISPATCH IF NECESSARY
011F' E1           POP   H ;GET MUTUTAL EXCLUSION SEMAPHORE
0120' C3 0000:08   JMP   SIGNAL# ;SIGNAL PROCESS AS READY

;
0123' 21 0036"     ..OUT3: LXI   H,S3XSPH ;GET SERIAL 3 OUT SEMAPHORE
0126' E5           PUSH  H ;SAVE SERIAL 3 OUT SEMAPHORE
0127' CD 0000:06   CALL  WAIT# ;WAIT ON MUTUAL EXCLUSION
012A' 21 0028"     LXI   H,S3OCHR ;GET SERIAL 3 OUTPUT CHARACTER
012D' 71           MOV   M,C ;SAVE OUTPUT CHARACTER
012E' 11 01A3'    LXI   D,S3OPOL ;GET SERIAL 3 OUT POLL ROUTINE
0131' CD 0000:07   CALL  LNKPOL# ;CREATE POLL ROUTINE
0134' CD 01A7'    CALL  S3OPR ;EXECUTE POLL ROUTINE
0137' 21 0030"     LXI   H,S3OSPH ;GET SERIAL 3 OUT SEMAPHORE
013A' CD 0000:06   CALL  WAIT# ;DISPATCH IF NECESSARY
013D' E1           POP   H ;GET MUTUTAL EXCLUSION SEMAPHORE
013E' C3 0000:08   JMP   SIGNAL# ;SIGNAL PROCESS AS READY

;
0141' 21 0054"     ..OUT4: LXI   H,S4XSPH ;GET SERIAL 4 OUT SEMAPHORE
0144' E5           PUSH  H ;SAVE SERIAL 4 OUT SEMAPHORE
0145' CD 0000:06   CALL  WAIT# ;WAIT ON MUTUAL EXCLUSION
0148' 21 0046"     LXI   H,S4OCHR ;GET SERIAL 4 OUTPUT CHARACTER
014B' 71           MOV   M,C ;SAVE OUTPUT CHARACTER
014C' 11 01C9'    LXI   D,S4OPOL ;GET SERIAL 4 OUT POLL ROUTINE
014F' CD 0000:07   CALL  LNKPOL# ;CREATE POLL ROUTINE
0152' CD 01CD'    CALL  S4OPR ;EXECUTE POLL ROUTINE
0155' 21 004E"     LXI   H,S4OSPH ;GET SERIAL 4 OUT SEMAPHORE
0158' CD 0000:06   CALL  WAIT# ;DISPATCH IF NECESSARY
015B' E1           POP   H ;GET MUTUTAL EXCLUSION SEMAPHORE
015C' C3 0000:08   JMP   SIGNAL# ;SIGNAL PROCESS AS READY

;
015F' 21 0072"     ..OUT5: LXI   H,S5XSPH ;GET SERIAL 5 OUT SEMAPHORE

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0162' E5          PUSH    H          ;SAVE SERIAL 5 OUT SEMAPHORE
0163' CD 0000:06 CALL    WAIT#       ;WAIT ON MUTUAL EXCLUSION
0166' 21 0064" LXI    H,S5OCHR    ;GET SERIAL 5 OUTPUT CHARACTER
0169' 71          MOV     M,C         ;SAVE OUTPUT CHARACTER
016A' 11 01EF' LXI    D,S5OPOL    ;GET SERIAL 5 OUT POLL ROUTINE
016D' CD 0000:07 CALL    LNKPOL#    ;CREATE POLL ROUTINE
0170' CD 01F3' CALL    S5OPR      ;EXECUTE POLL ROUTINE
0173' 21 006C" LXI    H,S5OSPH    ;GET SERIAL 5 OUT SEMAPHORE
0176' CD 0000:06 CALL    WAIT#       ;DISPATCH IF NECESSARY
0179' E1          POP     H          ;GET MUTUAL EXCLUSION SEMAPHORE
017A' C3 0000:08 JMP     SIGNAL#     ;SIGNAL PROCESS AS READY

;
017D'           ;S2OPOL:           ;SERIAL 2 OUTPUT POLL ROUTINE
017D' 0000          .WORD    0          ;SUCCESSOR LINK POINTER
017F' 0000          .WORD    0          ;PREDECESSOR LINK POINTER

;
0181' DBE5          ;S2OPR: IN     S2LSR    ;GET SERIAL 2 LINE STATUS REGISTER
0183' CB6F          BIT     TBE,A      ;TRANSMIT BUFFER EMPTY?
0185' C8            RZ              ;IF NOT, DONE
0186' 21 000B" LXI    H,S2BR    ;ELSE, GET SERIAL 2 BAUD RATE CODE
0189' CB76          BIT     6,M       ;CLEAR TO SEND HANDSHAKING?
018B' 2805          JRZ     ..NCTS    ;IF NOT, CONTINUE
018D' DBE6          IN     S2MSR    ;GET SERIAL 2 MODEM STATUS REGISTE
018F' CB67          BIT     CTS,A     ;CLEAR TO SEND STATUS TRUE?
0191' C8            RZ              ;IF NOT, DONE
0192' 3A 000A" ..NCTS: LDA     S2OCHR  ;GET SERIAL 2 OUTPUT CHARACTER
0195' D3E0          OUT     S2DATA   ;OUTPUT CHARACTER
0197' 21 017D' LXI    H,S2OPOL  ;GET SERIAL 2 OUT POLL ROUTINE
019A' CD 0000:09 CALL    UNLINK#    ;UNLINK POLL ROUTINE
019D' 21 0012" LXI    H,S2OSPH  ;GET SERIAL 2 OUT SEMAPHORE
01A0' C3 0000:08 JMP     SIGNAL#     ;SIGNAL PROCESS AS READY

;
01A3'           ;S3OPOL:           ;SERIAL 3 OUTPUT POLL ROUTINE
01A3' 0000          .WORD    0          ;SUCCESSOR LINK POINTER
01A5' 0000          .WORD    0          ;PREDECESSOR LINK POINTER

;
01A7' DBED          ;S3OPR: IN     S3LSR    ;GET SERIAL 3 LINE STATUS REGISTER
01A9' CB6F          BIT     TBE,A      ;TRANSMIT BUFFER EMPTY?
01AB' C8            RZ              ;IF NOT, DONE
01AC' 21 0029" LXI    H,S3BR    ;ELSE, GET SERIAL 3 BAUD RATE CODE
01AF' CB76          BIT     6,M       ;CLEAR TO SEND HANDSHAKING?
01B1' 2805          JRZ     ..NCTS    ;IF NOT, CONTINUE
01B3' DBE6          IN     S3MSR    ;GET SERIAL 3 MODEM STATUS REGISTE
01B5' CB67          BIT     CTS,A     ;CLEAR TO SEND STATUS TRUE?
01B7' C8            RZ              ;IF NOT, DONE
01B8' 3A 0028" ..NCTS: LDA     S3OCHR  ;GET SERIAL 3 OUTPUT CHARACTER
01BB' D3E8          OUT     S3DATA   ;OUTPUT CHARACTER
01BD' 21 01A3' LXI    H,S3OPOL  ;GET SERIAL 3 OUT POLL ROUTINE
01C0' CD 0000:09 CALL    UNLINK#    ;UNLINK POLL ROUTINE
01C3' 21 0030" LXI    H,S3OSPH  ;GET SERIAL 3 OUT SEMAPHORE
01C6' C3 0000:08 JMP     SIGNAL#     ;SIGNAL PROCESS AS READY

;
01C9'           ;S4OPOL:           ;SERIAL 4 OUTPUT POLL ROUTINE
01C9' 0000          .WORD    0          ;SUCCESSOR LINK POINTER

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000, INC.

```

01CB' 0000          .WORD 0          ;PREDECESSOR LINK POINTER
;
01CD' DBF5          ;S4OPR: IN      S4LSR   ;GET SERIAL 4 LINE STATUS REGISTER
01CF' CB6F          BIT      TBE,A    ;TRANSMIT BUFFER EMPTY?
01D1' C8            RZ              ;IF NOT, DONE
01D2' 21 0047"     LXI      H,S4BR   ;ELSE, GET SERIAL 4 BAUD RATE CODE
01D5' CB76          BIT      6,M     ;CLEAR TO SEND HANDSHAKING?
01D7' 2805         JRZ       ..NCTS  ;IF NOT, CONTINUE
01D9' DBF6          IN       S4MSR   ;GET SERIAL 4 MODEM STATUS REGISTE
01DB' CB67          BIT      CTS,A   ;CLEAR TO SEND STATUS TRUE?
01DD' C8            RZ              ;IF NOT, DONE
01DE' 3A 0046"     ..NCTS: LDA     S4OCHR ;GET SERIAL 4 OUTPUT CHARACTER
01E1' D3F0          OUT     S4DATA  ;OUTPUT CHARACTER
01E3' 21 01C9'     LXI      H,S4OPOL ;GET SERIAL 4 OUT POLL ROUTINE
01E6' CD 0000:09   CALL    UNLINK# ;UNLINK POLL ROUTINE
01E9' 21 004E"     LXI      H,S4OSPH ;GET SERIAL 4 OUT SEMAPHORE
01EC' C3 0000:08   JMP     SIGNAL# ;SIGNAL PROCESS AS READY
;
01EF'              ;S5OPOL:          ;SERIAL 5 OUTPUT POLL ROUTINE
01EF' 0000          .WORD 0          ;SUCCESSOR LINK POINTER
01F1' 0000          .WORD 0          ;PREDECESSOR LINK POINTER
;
01F3' DBFD          ;S5OPR: IN      S5LSR   ;GET SERIAL 5 LINE STATUS REGISTER
01F5' CB6F          BIT      TBE,A    ;TRANSMIT BUFFER EMPTY?
01F7' C8            RZ              ;IF NOT, DONE
01F8' 21 0065"     LXI      H,S5BR   ;ELSE, GET SERIAL 5 BAUD RATE CODE
01FB' CB76          BIT      6,M     ;CLEAR TO SEND HANDSHAKING?
01FD' 2805         JRZ       ..NCTS  ;IF NOT, CONTINUE
01FF' DBFE          IN       S5MSR   ;GET SERIAL 5 MODEM STATUS REGISTE
0201' CB67          BIT      CTS,A   ;CLEAR TO SEND STATUS TRUE?
0203' C8            RZ              ;IF NOT, DONE
0204' 3A 0064"     ..NCTS: LDA     S5OCHR ;GET SERIAL 5 OUTPUT CHARACTER
0207' D3F8          OUT     S5DATA  ;OUTPUT CHARACTER
0209' 21 01EF'     LXI      H,S5OPOL ;GET SERIAL 5 OUT POLL ROUTINE
020C' CD 0000:09   CALL    UNLINK# ;UNLINK POLL ROUTINE
020F' 21 006C"     LXI      H,S5OSPH ;GET SERIAL 5 OUT SEMAPHORE
0212' C3 0000:08   JMP     SIGNAL# ;SIGNAL PROCESS AS READY
;
0215' CD 0222'     ;ISR480::CALL   ..S2I   ;CHECK FOR SERIAL 2 INPUT
0218' CD 0276'     CALL    ..S3I   ;CHECK FOR SERIAL 3 INPUT
021B' CD 02CA'     CALL    ..S4I   ;CHECK FOR SERIAL 4 INPUT
021E' CD 0319'     CALL    ..S5I   ;CHECK FOR SERIAL 5 INPUT
0221' C9           RET          ;DONE
;
0222' DBE5          ;..S2I: IN      S2LSR   ;GET SERIAL 2 STATUS
0224' CB47          BIT      RDA,A    ;CHARACTER AVAILABLE
0226' C8            RZ              ;IF NOT, DONE
0227' DBE0          IN       S2DATA  ;ELSE, GET SERIAL 2 DATA CHARACTER
0229' 21 000B"     LXI      H,S2BR   ;GET SERIAL 2 BAUD RATE CODE
022C' CB6E          BIT      5,M     ;INHIBIT INPUT FLAG SET?
022E' C0            RNZ          ;IF SO, DONE
022F' 4F            MOV     C,A     ;SERIAL 2 DATA CHARACTER TO C-REG
0230' CB7E          BIT      7,M     ;ATTENTION DETECTION FLAG SET?
0232' 2814         JRZ       ..NAD2  ;IF NOT, CONTINUE

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000, INC.

```

0234'   CBB9           RES      7,C      ;STRIP SIGN BIT ON INPUT CHARACTER
0236'   3A 0000:0A   LDA      ATNCHR# ;GET ATTENTION CHARACTER
0239'   B9            CMP      C        ;CHARACTER=ATTENTION CHARACTER?
023A'   200C         JRNZ    ..NAD2   ;IF NOT, CONTINUE
023C'   2A 0004"     LHL     S2IPTR ;ELSE, GET SERIAL 2 INPUT POINTER
023F'   22 0006"     SHLD   S2OPTR ;RESET SERIAL 2 OUTPUT POINTER
0242'   21 0000     LXI     H,0
0245'   22 0008"     SHLD   S2ICNT ;SET SERIAL 2 INPUT COUNT=0
0248'   2A 0000"     ..NAD2: LHL     S2IBSZ ;GET SERIAL 2 INPUT BUFFER SIZE
024B'   ED5B 0008"   LDE     S2ICNT ;GET SERIAL 2 INPUT COUNT
024F'   13           INX     D        ;INCREMENT SERIAL 2 INPUT COUNT
0250'   B7           ORA     A        ;CLEAR CARRY FLAG
0251'   ED52         DSBC   D        ;SERIAL 2 INPUT BUFFER FULL?
0253'   DO           RNC      ;IF SO, DONE
0254'   ED53 0008"   SDE     S2ICNT ;ELSE, UPDATE SERIAL 2 INPUT COUNT
0258'   2A 0004"     LHL     S2IPTR ;GET SERIAL 2 INPUT POINTER
025B'   71           MOV     M,C    ;STORE INPUT CHARACTER IN BUFFER
025C'   23           INX     H        ;INCREMENT INPUT POINTER
025D'   EB           XCHG   ;INPUT BUFFER POINTER TO DE-REG
025E'   2A 0000"     LHL     S2IBSZ ;GET SERIAL 2 INPUT BUFFER SIZE
0261'   2B           DCX     H        ;DECREMENT INPUT BUFFER SIZE
0262'   ED4B 0002"   LBCD   S2IBUF ;GET SERIAL 2 INPUT BUFFER ADDRESS
0266'   09           DAD     B        ;CALC LAST INPUT BUFFER ADDRESS
0267'   ED52         DSBC   D        ;BUFFER WRAP-AROUND?
0269'   3004         JRNC   ..NWA2   ;IF NOT, CONTINUE
026B'   ED5B 0002"   LDE     S2IBUF ;GET SERIAL 2 INPUT BUFFER ADDRESS
026F'   ED53 0004"   ..NWA2: SDE     S2IPTR ;UPDATE SERIAL 2 INPUT POINTER
0273'   C3 036D'    JMP     ..X    ;CONTINUE

;
..S3I: IN      S3LSR   ;GET SERIAL 3 STATUS
0276'   DBED         ;CHARACTER AVAILABLE
0278'   CB47         RZ      ;IF NOT, DONE
027A'   C8           IN      S3DATA   ;ELSE, GET SERIAL 3 DATA CHARACTER
027B'   DBE8         LXI     H,S3BR  ;GET SERIAL 3 BAUD RATE CODE
027D'   21 0029"     BIT     5,M    ;INHIBIT INPUT FLAG SET?
0280'   CB6E         RNZ     ;IF SO, DONE
0282'   CO           MOV     C,A    ;SERIAL 3 DATA CHARACTER TO C-REG
0283'   4F           BIT     7,M    ;ATTENTION DETECTION FLAG SET?
0284'   CB7E         JRZ     ..NAD3   ;IF NOT, CONTINUE
0286'   2814         RES     7,C    ;STRIP SIGN BIT ON INPUT CHARACTER
0288'   CBB9         LDA      ATNCHR# ;GET ATTENTION CHARACTER
028A'   3A 0000:0A   CMP     C        ;CHARACTER=ATTENTION CHARACTER?
028D'   B9            JRNZ    ..NAD3   ;IF NOT, CONTINUE
028E'   200C         LHL     S3IPTR ;ELSE, GET SERIAL 3 INPUT POINTER
0290'   2A 0022"     SHLD   S3OPTR ;RESET SERIAL 3 OUTPUT POINTER
0293'   22 0024"     LXI     H,0
0296'   21 0000     SHLD   S3ICNT ;SET SERIAL 3 INPUT COUNT=0
0299'   22 0026"     ..NAD3: LHL     S3IBSZ ;GET SERIAL 3 INPUT BUFFER SIZE
029C'   2A 001E"     LDE     S3ICNT ;GET SERIAL 3 INPUT COUNT
029F'   ED5B 0026"   INX     D        ;INCREMENT SERIAL 3 INPUT COUNT
02A3'   13           ORA     A        ;CLEAR CARRY FLAG
02A4'   B7           DSBC   D        ;SERIAL 3 INPUT BUFFER FULL?
02A5'   ED52         RNC      ;IF SO, DONE
02A7'   DO           SDE     S3ICNT ;ELSE, UPDATE SERIAL 3 INPUT COUNT
02A8'   ED53 0026"

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

02AC' 2A 0022"      LHL D    S3IPTR ;GET SERIAL 3 INPUT POINTER
02AF' 71           MOV     M,C    ;STORE INPUT CHARACTER IN BUFFER
02B0' 23           INX     H      ;INCREMENT INPUT POINTER
02B1' EB           XCHG           ;INPUT BUFFER POINTER TO DE-REG
02B2' 2A 001E"     LHL D    S3IBSZ ;GET SERIAL 3 INPUT BUFFER SIZE
02B5' 2B           DCX     H      ;DECREMENT INPUT BUFFER SIZE
02B6' ED4B 0020"   LBCD   S3IBUF ;GET SERIAL 3 INPUT BUFFER ADDRESS
02BA' 09           DAD     B      ;CALC LAST INPUT BUFFER ADDRESS
02BB' ED52         DSBC   D      ;BUFFER WRAP-AROUND?
02BD' 3004         JRNC   ..NWA3 ;IF NOT, CONTINUE
02BF' ED5B 0020"   LDED   S3IBUF ;GET SERIAL 3 INPUT BUFFER ADDRESS
02C3' ED53 0022"   ..NWA3: SDED   S3IPTR ;UPDATE SERIAL 3 INPUT POINTER
02C7' C3 036D'     JMP     ..X    ;CONTINUE

;
02CA' DBF5         ..S4I: IN     S4LSR ;GET SERIAL 4 STATUS
02CC' CB47         BIT     RDA,A  ;CHARACTER AVAILABLE
02CE' C8           RZ           ;IF NOT, DONE
02CF' DBFO         IN     S4DATA ;ELSE, GET SERIAL 4 DATA CHARACTER
02D1' 21 0047"     LXI   H,S4BR ;GET SERIAL 4 BAUD RATE CODE
02D4' CB6E         BIT     5,M    ;INHIBIT INPUT FLAG SET?
02D6' C0           RNZ           ;IF SO, DONE
02D7' 4F           MOV     C,A    ;SERIAL 4 DATA CHARACTER TO C-REG
02D8' CB7E         BIT     7,M    ;ATTENTION DETECTION FLAG SET?
02DA' 2814         JRZ     ..NAD4 ;IF NOT, CONTINUE
02DC' CBB9         RES     7,C    ;STRIP SIGN BIT ON INPUT CHARACTER
02DE' 3A 0000:0A   LDA   ATNCHR# ;GET ATTENTION CHARACTER
02E1' B9           CMP     C      ;CHARACTER=ATTENTION CHARACTER?
02E2' 200C         JRNZ   ..NAD4 ;IF NOT, CONTINUE
02E4' 2A 0040"     LHL D    S4IPTR ;ELSE, GET SERIAL 4 INPUT POINTER
02E7' 22 0042"     SHLD  S4OPTR ;RESET SERIAL 4 OUTPUT POINTER
02EA' 21 0000     LXI   H,0
02ED' 22 0044"     SHLD  S4ICNT ;SET SERIAL 4 INPUT COUNT=0
02F0' 2A 003C"     ..NAD4: LHL D    S4IBSZ ;GET SERIAL 4 INPUT BUFFER SIZE
02F3' ED5B 0044"   LDED   S4ICNT ;GET SERIAL 4 INPUT COUNT
02F7' 13           INX     D      ;INCREMENT SERIAL 4 INPUT COUNT
02F8' B7           ORA     A      ;CLEAR CARRY FLAG
02F9' ED52         DSBC   D      ;SERIAL 4 INPUT BUFFER FULL?
02FB' D0           RNC           ;IF SO, DONE
02FC' ED53 0044"   S4ICNT ;ELSE, UPDATE SERIAL 4 INPUT COUNT
0300' 2A 0040"     S4IPTR ;GET SERIAL 4 INPUT POINTER
0303' 71           MOV     M,C    ;STORE INPUT CHARACTER IN BUFFER
0304' 23           INX     H      ;INCREMENT INPUT POINTER
0305' 2B           DCX     H      ;DECREMENT INPUT BUFFER SIZE
0306' ED4B 003E"   LBCD   S4IBUF ;GET SERIAL 4 INPUT BUFFER ADDRESS
030A' 09           DAD     B      ;CALC LAST INPUT BUFFER ADDRESS
030B' ED52         DSBC   D      ;BUFFER WRAP-AROUND?
030D' 3004         JRNC   ..NWA4 ;IF NOT, CONTINUE
030F' ED5B 003E"   LDED   S4IBUF ;GET SERIAL 4 INPUT BUFFER ADDRESS
0313' ED53 0040"   ..NWA4: SDED   S4IPTR ;UPDATE SERIAL 4 INPUT POINTER
0317' 1854         JMP     ..X    ;CONTINUE

;
0319' DBFD         ..S5I: IN     S5LSR ;GET SERIAL 5 STATUS
031B' CB47         BIT     RDA,A  ;CHARACTER AVAILABLE
031D' C8           RZ           ;IF NOT, DONE

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

031E'   DBF8           IN      S5DATA   ;ELSE, GET SERIAL 5 DATA CHARACTER
0320'   21 0065"     LXI      H,S5BR   ;GET SERIAL 5 BAUD RATE CODE
0323'   CB6E         BIT      5,M     ;INHIBIT INPUT FLAG SET?
0325'   C0           RNZ          ;IF SO, DONE
0326'   4F          MOV      C,A     ;SERIAL 5 DATA CHARACTER TO C-REG
0327'   CB7E         BIT      7,M     ;ATTENTION DETECTION FLAG SET?
0329'   2814         JRZ      ..NAD5  ;IF NOT, CONTINUE
032B'   CBB9         RES      7,C     ;STRIP SIGN BIT ON INPUT CHARACTER
032D'   3A 0000:0A   LDA      ATNCHR# ;GET ATTENTION CHARACTER
0330'   B9          CMP      C       ;CHARACTER=ATTENTION CHARACTER?
0331'   200C         JRNZ     ..NAD5  ;IF NOT, CONTINUE
0333'   2A 005E"     LHLD     S5IPTR  ;ELSE, GET SERIAL 5 INPUT POINTER
0336'   22 0060"     SHLD     S5OPTR  ;RESET SERIAL 5 OUTPUT POINTER
0339'   21 0000     LXI      H,0      ;
033C'   22 0062"     SHLD     S5ICNT  ;SET SERIAL 5 INPUT COUNT=0
033F'   2A 005A"     ..NAD5: LHLD     S5IBSZ  ;GET SERIAL 5 INPUT BUFFER SIZE
0342'   ED5B 0062"  LDED     S5ICNT  ;GET SERIAL 5 INPUT COUNT
0346'   13          INX      D       ;INCREMENT SERIAL 5 INPUT COUNT
0347'   B7          ORA      A       ;CLEAR CARRY FLAG
0348'   ED52         DSBC     D       ;SERIAL 5 INPUT BUFFER FULL?
034A'   D0          RNC          ;IF SO, DONE
034B'   ED53 0062"  SDED     S5ICNT  ;ELSE, UPDATE SERIAL 5 INPUT COUNT
034F'   2A 005E"     LHLD     S5IPTR  ;GET SERIAL 5 INPUT POINTER
0352'   71          MOV      M,C     ;STORE INPUT CHARACTER IN BUFFER
0353'   23          INX      H       ;INCREMENT INPUT POINTER
0354'   EB          XCHG          ;INPUT BUFFER POINTER TO DE-REG
0355'   2A 005A"     LHLD     S5IBSZ  ;GET SERIAL 5 INPUT BUFFER SIZE
0358'   2B          DCX      H       ;DECREMENT INPUT BUFFER SIZE
0359'   ED4B 005C"  LBCD     S5IBUF  ;GET SERIAL 5 INPUT BUFFER ADDRESS
035D'   09          DAD      B       ;CALC LAST INPUT BUFFER ADDRESS
035E'   ED52         DSBC     D       ;BUFFER WRAP-AROUND?
0360'   3004         JRNC     ..NWA5  ;IF NOT, CONTINUE
0362'   ED5B 005C"  LDED     S5IBUF  ;GET SERIAL 5 INPUT BUFFER ADDRESS
0366'   ED53 005E"  ..NWA5: S5IPTR  ;UPDATE SERIAL 5 INPUT POINTER
036A'   21 0066"     LXI      H,S5ISPH ;GET SERIAL 5 INPUT SEMAPHORE
;
036D'   7E          ..X:  MOV      A,M   ;GET SEMAPHORE COUNT
036E'   B7          ORA      A       ;SEMAPHORE COUNT=0?
036F'   C8          RZ          ;IF SO, DONE
0370'   C3 0000:08  JMP      SIGNAL# ;ELSE, SIGNAL PROCESS AS READY
;
0373'   CD 0000:0B  SBR480::CALL GETBTV# ;GET BAUD RATE TIMER VALUE
0376'   78          MOV      A,B   ;GET CHANNEL NUMBER
0377'   D602         SUI      2     ;REMOVE CHANNEL NUMBER BIAS
0379'   F5          PUSH     PSW    ;SAVE CHANNEL NUMBER
037A'   C5          PUSH     B     ;SAVE BAUD RATE CODE
037B'   87          ADD      A     ;X2
037C'   87          ADD      A     ;X2=X4
037D'   87          ADD      A     ;X2=X8
037E'   F6E3         ORI      IOBASE+3 ;CALC LINE CONTROL REGISTER
0380'   4F          MOV      C,A   ;LINE CONTROL REGISTER TO C-REG
0381'   3E83         MVI      A,LCRCW!80H ;GET DIVISOR LATCH ACCESS BIT
0383'   ED79         OUTP    A     ;SELECT DIVISOR LATCH
0385'   OD          DCR      C     ;CALC DATA REGISTER

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)

COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0386'   OD           DCR      C
0387'   OD           DCR      C
0388'   ED59        OUTP     E      ;OUTPUT LSB OF TIMER VALUE
038A'   OC           INR      C      ;CALC DATA REGISTER+1
038B'   ED51        OUTP     D      ;OUTPUT MSB OF TIMER VALUE
038D'   OC           INR      C      ;CALC LINE CONTROL REGISTER
038E'   OC           INR      C
038F'   3E03        MVI      A,LCRCW ;GET LINE CONTROL REGISTER VALUE
0391'   ED79        OUTP     A      ;DE-SELECT DIVISOR LATCH
0393'   C1          POP      B      ;RESTORE BAUD RATE CODE
0394'   F1          POP      PSW    ;RESTORE CHANNEL NUMBER
0395'   2808        JRZ      ..SBR2 ;IF CHANNEL NUMBER=2, CONTINUE
0397'   3D          DCR      A      ;CHANNEL NUMBER=3?
0398'   280A        JRZ      ..SBR3 ;IF SO, CONTINUE
039A'   3D          DCR      A      ;CHANNEL NUMBER=4?
039B'   280C        JRZ      ..SBR4 ;IF SO, CONTINUE
039D'   180F        JMPR     ..SBR5 ;ELSE, CONTINUE

;
039F'   79          ;..SBR2: MOV      A,C      ;GET SERIAL 2 BAUD RATE CODE
03A0'   32 000B"   STA      S2BR    ;SET SERIAL 2 BAUD RATE CODE
03A3'   C9          RET              ;DONE

;
03A4'   79          ;..SBR3: MOV      A,C      ;GET SERIAL 3 BAUD RATE CODE
03A5'   32 0029"   STA      S3BR    ;SET SERIAL 3 BAUD RATE CODE
03A8'   C9          RET              ;DONE

;
03A9'   79          ;..SBR4: MOV      A,C      ;GET SERIAL 4 BAUD RATE CODE
03AA'   32 0047"   STA      S4BR    ;SET SERIAL 4 BAUD RATE CODE
03AD'   C9          RET              ;DONE

;
03AE'   79          ;..SBR5: MOV      A,C      ;GET SERIAL 5 BAUD RATE CODE
03AF'   32 0065"   STA      S5BR    ;SET SERIAL 5 BAUD RATE CODE
03B2'   C9          RET              ;DONE

;
03B3'   D602        RBR480: SUI      2      ;CHANNEL NUMBER=2?
03B5'   2808        JRZ      ..RBR2    ;IF SO, CONTINUE
03B7'   3D          DCR      A      ;CHANNEL NUMBER=3?
03B8'   2809        JRZ      ..RBR3    ;IF SO, CONTINUE
03BA'   3D          DCR      A      ;CHANNEL NUMBER=4?
03BB'   280A        JRZ      ..RBR4    ;IF SO, CONTINUE
03BD'   180C        JMPR     ..RBR5    ;ELSE, CONTINUE

;
03BF'   3A 000B"   ;..RBR2: LDA      S2BR    ;GET SERIAL 2 BAUD RATE CODE
03C2'   C9          RET              ;DONE

;
03C3'   3A 0029"   ;..RBR3: LDA      S3BR    ;GET SERIAL 3 BAUD RATE CODE
03C6'   C9          RET              ;DONE

;
03C7'   3A 0047"   ;..RBR4: LDA      S4BR    ;GET SERIAL 4 BAUD RATE CODE
03CA'   C9          RET              ;DONE

;
03CB'   3A 0065"   ;..RBR5: LDA      S5BR    ;GET SERIAL 5 BAUD RATE CODE
03CE'   C9          RET              ;DONE

;

```

SER480 - TURBODOS OPERATING SYSTEM SERIAL DRIVER (IMS 480)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

03CF' 78          SMC480::MOV  A,B      ;GET CHANNEL NUMBER
03D0' D602        SUI  2          ;REMOVE CHANNEL NUMBER BIAS
03D2' 87          ADD  A           ;X2
03D3' 87          ADD  A           ;X2=X4
03D4' 87          ADD  A           ;X2=X8
03D5' F6E4        ORI  IOBASE+4    ;CALC MODEM CONTROL REGISTER
03D7' 4F          MOV  C,A        ;MODEM CONTROL REGISTER TO C-REG
03D8' 79          MOV  A,C        ;GET REQUESTED MODEM CONTROLS
03D9' 0F          RRC           ;SHIFT MODEM CONTROLS INTO BITS 6/'
03DA' 0F          RRC
03DB' ED79        OUTP  A         ;OUTPUT MODEM CONTROLS
03DD' C9          RET            ;DONE

;
03DE' 78          RMC480::MOV  A,B      ;GET CHANNEL NUMBER
03DF' D602        SUI  2          ;REMOVE CHANNEL NUMBER BIAS
03E1' 87          ADD  A           ;X2
03E2' 87          ADD  A           ;X2=X4
03E3' 87          ADD  A           ;X2=X8
03E4' F6E6        ORI  IOBASE+6    ;CALC MODEM STATUS REGISTER
03E6' 4F          MOV  C,A        ;MODEM STATUS REGISTER TO C-REG
03E7' ED50        INP  D          ;GET MODEM STATUS REGISTER
03E9' AF          XRA  A           ;PRESET RETURN CODE=0
03EA' CB62        BIT  4,D        ;CLEAR TO SEND BIT SET?
03EC' 2802        JRZ  ..NCTS     ;IF NOT, CONTINUE
03EE' CBFF        SET  7,A        ;ELSE, SET CLEAR TO SEND BIT
03F0' CB6A        ..NCTS: BIT  5,D  ;DATA SET READY BIT SET?
03F2' 2802        JRZ  ..NDSR     ;IF NOT, CONTINUE
03F4' CBF7        SET  6,A        ;ELSE, SET DATA SET READY BIT
03F6' CB7A        ..NDSR: BIT  7,D  ;DATA CARRIER DETECT BIT SET?
03F8' 2802        JRZ  ..NDCD     ;IF NOT, CONTINUE
03FA' CBEF        SET  5,A        ;ELSE, SET DATA CARRIER DETECT BIT
03FC' CB72        ..NDCD: BIT  6,D  ;RING INDICATOR BIT SET?
03FE' C8          RZ            ;IF NOT, DONE
03FF' CBE7        SET  4,A        ;ELSE, SET RING INDICATOR BIT
0401' C9          RET            ;DONE

;
.END

```

BRT442 - TURBODOS OPERATING SYSTEM BAUD RATE TABLE (IMS 442 OPTIONAL OSC)
 COPYRIGHT (C) 1982 BY SOFTWARE 2000. INC.

```

; *****
; *
; * This module contains the table of baud-rate divi- *
; * sor values used by the IMS 442 and IMS 480 I/O *
; * boards. It is used by the SPD442, SER480, and *
; * RTC442 modules. *
; *
; *****
    
```

```

; COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.
    
```

```

; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
    
```

```

; VERSION: EXAMPLE2
    
```

```

; IDENT BRT442 ;MODULE ID
    
```

```

; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
    
```

0600	BR50	= 1536	;50 BAUD TIMER VALUE
0400	BR75	= 1024	;75 BAUD TIMER VALUE
02BA	BR110	= 698	;110 BAUD TIMER VALUE
023B	BR1345	= 571	;134.5 BAUD TIMER VALUE
0200	BR150	= 512	;150 BAUD TIMER VALUE
0100	BR300	= 256	;300 BAUD TIMER VALUE
0080	BR600	= 128	;600 BAUD TIMER VALUE
0040	BR1200	= 64	;1200 BAUD TIMER VALUE
002B	BR1800	= 43	;1800 BAUD TIMER VALUE
0026	BR2000	= 38	;2000 BAUD TIMER VALUE
0020	BR2400	= 32	;2400 BAUD TIMER VALUE
0015	BR3600	= 21	;3600 BAUD TIMER VALUE
0010	BR4800	= 16	;4800 BAUD TIMER VALUE
000B	BR7200	= 11	;7200 BAUD TIMER VALUE
0008	BR9600	= 8	;9600 BAUD TIMER VALUE
0004	BR192K	= 4	;19200 BAUD TIMER VALUE

5000	RTCCNT	:: 20480	;RTC COUNT (1/60 SECOND TICK)
003C	TICSEC	:: 60	;RTC TICKS PER SECOND

```

; .LOC .PROG.# ;LOCATE IN PROGRAM AREA
    
```

```

; BRTBL:: .WORD BR50 ;50 BAUD TIMER VALUE
0000' 0600 .WORD BR75 ;75 BAUD TIMER VALUE
0002' 0400 .WORD BR110 ;110 BAUD TIMER VALUE
0004' 02BA .WORD BR1345 ;134.5 BAUD TIMER VALUE
0006' 023B .WORD BR150 ;150 BAUD TIMER VALUE
0008' 0200 .WORD BR300 ;300 BAUD TIMER VALUE
000A' 0100 .WORD BR600 ;600 BAUD TIMER VALUE
000C' 0080 .WORD BR1200 ;1200 BAUD TIMER VALUE
000E' 0040 .WORD BR1800 ;1800 BAUD TIMER VALUE
0010' 002B .WORD BR2000 ;2000 BAUD TIMER VALUE
0012' 0026 .WORD BR2400 ;2400 BAUD TIMER VALUE
0014' 0020
    
```

BRT442 - TURBODOS OPERATING SYSTEM BAUD RATE TABLE (IMS 442 OPTIONAL OSC)
COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

0016'	0015	.WORD	BR3600	;3600 BAUD TIMER VALUE
0018'	0010	.WORD	BR4800	;4800 BAUD TIMER VALUE
001A'	000B	.WORD	BR7200	;7200 BAUD TIMER VALUE
001C'	0008	.WORD	BR9600	;9600 BAUD TIMER VALUE
001E'	0004	.WORD	BR192K	;19200 BAUD TIMER VALUE

;
.END

RTC442 - TURBODOS OPERATING SYSTEM IMS REAL TIME CLOCK ROUTINES
 COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.

```

; *****
; *
; * This is a real-time clock driver, which utilizes *
; * a counter on the IMS 442 I/O board to provide a *
; * periodic "tick" interrupt at 60 hertz. *
; *
; *****
;
; COPYRIGHT (C) 1982 BY SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT   RTC442           ;MODULE ID
;
; INSERT  DREQUATE        ;DRIVER SYMBOLIC EQUIVALENCES
;
0010     IOBASE = 10H      ;SERIAL/PARALLEL I/O PORT BASE
;
0016     TIM2   = IOBASE+06H ;TIMER 2 DATA REGISTER
0017     TIMCTL = IOBASE+07H ;TIMER CONTROL REGISTER
0018     SINTE  = IOBASE+08H ;SERIAL INTERRUPT ENABLE REGISTER
0019     T2RES  = IOBASE+09H ;TIMER 2 INTERRUPT RESET
;
0001     RTCENA = 1        ;REAL TIME CLOCK ENABLE BIT
;
00B6     T2CMD  = 0B6H     ;TIMER 2 COMMAND
;
0000"    .LOC   .DATA.#   ;LOCATE IN DATA AREA
;
0000"    00      TICCTR: .BYTE 0      ;TICK COUNTER
;
0000:04   .LOC   .INIT.#   ;LOCATE IN INITIALIZATION AREA
;
0000:04 3EC3   RTCNIT: MVI   A, JMP   ;INIT RTC INTERRUPT VECTOR ADDR
0002:04 32 0008 STA     1*8
0005:04 21 0000' LXI     H, RTCISR
0008:04 22 0009 SHLD   (1*8)+1
000B:04 3EB6   MVI     A, T2CMD ;GET TIMER 2 COMMAND
000D:04 D317   OUT     TIMCTL ;SELECT TIMER 2
000F:04 21 0000:05 LXI     H, RTCCNT# ;GET RTC COUNTER VALUE
0012:04 7D     MOV     A, L ;GET LSB OF TIMER VALUE
0013:04 D316   OUT     TIM2 ;OUTPUT IT TO TIMER 2 DATA REGISTE
0015:04 7C     MOV     A, H ;GET MSB OF TIMER VALUE
0016:04 D316   OUT     TIM2 ;OUTPUT IT TO TIMER 2 DATA REGISTE
0018:04 21 0000:06 LXI     H, INTMSK# ;GET INTERRUPT MASK
001B:04 CBCE   SET     RTCENA, M ;SET RTC INTERRUPT ENABLE BIT
001D:04 3A 0000:06 LDA     INTMSK ;GET INTERRUPT MASK
0020:04 D318   OUT     SINTE ;ENABLE RTC INTERRUPT MASK
0022:04 C9     RET     ;DONE
;
    
```

RTC442 - TURBODOS OPERATING SYSTEM IMS REAL TIME CLOCK ROUTINES
 COPYRIGHT (C) 1982 BY SOFTWARE 2000. INC.

```

0000'          .LOC      .PROG.# ;LOCATE IN PROGRAM AREA
          ;
0000' ED73 0000:07  RTCISR: SSPD  INTSP# ;SAVE STACK POINTER
0004' 31 0000:08    LXI      SP,INTSTK# ;SET UP AUX STACK POINTER
0007' F5          PUSH     PSW      ;SAVE REGISTERS
0008' C5          PUSH     B
0009' D5          PUSH     D
000A' E5          PUSH     H
000B' D319        OUT      T2RES   ;RESET RTC INTERRUPT
000D' 21 0000"    LXI      H,TICCTR ;GET TICK COUNTER
0010' 34          INR      M        ;INCREMENT TICK COUNTER
0011' 7E          MOV      A,M      ;GET TICK COUNT
0012' 01 0000:09 LXI      B,TICSEC# ;GET NUMBER OF TICKS PER SECOND
0015' B9          CMP      C        ;SECONDS COUNT REACHED?
0016' 3805        JRC      ..NSEC  ;IF NOT, CONTINUE
0018' 3600        MVI      M,0      ;ELSE, RESET TICK COUNTER
001A' CD 0000:0A  CALL     RTCSEC# ;SERVICE REAL TIME CLOCK MANAGER
001D' CD 0000:0B  ..NSEC: CALL    DLYTIC# ;SERVICE DISPATCHER DELAY MANAGER
0020' E1          POP      H        ;RESTORE REGISTERS
0021' D1          POP      D
0022' C1          POP      B
0023' F1          POP      PSW
0024' ED7B 0000:07 LSPD   INTSP# ;RESTORE STACK POINTER
0028' C3 0000:0C  JMP     ISRXIT# ;CONTINUE
          ;
          .END

```

NIT740 - TURBODOS OPERATING SYSTEM HARDWARE INITIALIZATION (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000. INC.

```

;
; *****
; *
; * This is the hardware initialization routine for *
; * an IMS 740 slave processor board. It consists *
; * of calls to the initialization entrypoints of *
; * other driver modules. *
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT NIT740 ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0000:04 .LOC .INIT.# ;LOCATE IN INITIALIZATION AREA
;
0000:04 CD 0000:05 HDWNIT::CALL SPINIT# ;INITIALIZE SERIAL/PARALLEL I/O
0003:04 C3 0000:06 JMP CKTINA# ;INITIALIZE CIRCUIT DRIVER A
;
; .END

```

SCD740 - TURBODOS OPERATING SYSTEM SLAVE CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000. INC.

```

; *****
; *
; * This is a simple network circuit driver which runs
; * in an IMS 740 slave processor board, and communi-
; * cates with a similar but more complex driver
; * MCD740 running in the master processor.
; *
; * The IMS 740 slave communicates with the master
; * processor over the S-100 bus via a byte-parallel
; * transfer, using programmed I/O at both ends. The
; * IMS 740 board appears to the master as an ordinary
; * port-addressed peripheral device. The interface
; * is accomplished using an Intel 8255 PIO (on the
; * master side) connected to a Zilog Z80 PIO (on the
; * slave side). The master can interrupt the 740
; * slave processor to see if it is still healthy, and
; * this driver must service the interrupt and send an
; * acknowledgement to the master.
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT   SCD740           ;MODULE ID
;
; INSERT DREQUATE           ;DRIVER SYMBOLIC EQUIVALENCES
;
0010      PIOVEC = 10H      ;PIO INTERRUPT VECTOR ADDRESS
;
0020      PORTAD = 20H     ;8255 PORT A DATA REGISTER
0024      PIOADR = 24H     ;PIO PORT A DATA REGISTER
0025      PIOBDR = 25H     ;PIO PORT B DATA REGISTER
0026      PIOACR = 26H     ;PIO PORT A CONTROL REGISTER
0027      PIOBCR = 27H     ;PIO PORT B CONTROL REGISTER
;
0004      PORTC0 = 4       ;PORT C DATA BIT 0 (INT)
0005      PORTC5 = 5       ;PORT C DATA BIT 5 (IBF)
0006      PORTC7 = 6       ;PORT C DATA BIT 7 (OBF)
0007      RAMPER = 7       ;RAM PARITY ERROR
;
0006      ROMENA = 6       ;ROM ENABLE BIT
0007      PERRES = 7       ;PARITY ERROR RESET
;
0000"      .LOC      .DATA.# ;LOCATE IN DATA AREA
;
0000"      0000      RCVSPH: .WORD 0 ;RECEIVE MESSAGE SEMAPHORE
0002"      0002"    ..RCVH: .WORD ..RCVH
0004"      0002"    ..RCVH: .WORD ..RCVH
    
```

SCD740 - TURBODOS OPERATING SYSTEM SLAVE CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0000:04          ;          .LOC      .INIT.# ;LOCATE IN INITIALIZATION AREA
;
0000:04 21 0041'   ;          CKTIN%::LXI    H,PIOISR  ;GET PIO A INTERRUPT SERVICE ADD
0003:04 22 0010   ;          SHLD    PIOVEC  ;SET INTERRUPT VECTOR ADDRESS
0006:04 3E10      ;          MVI     A,PIOVEC ;GET PIO A INTERRUPT VECTOR
0008:04 D326      ;          OUT    PIOACR  ;OUTPUT INTERRUPT SERVICE VECTOR
000A:04 3ECF      ;          MVI     A,OCFH  ;GET PIO A MODE WORD (MODE 3)
000C:04 D326      ;          OUT    PIOACR  ;OUTPUT PIO A MODE WORD
000E:04 3EFF      ;          MVI     A,OFFH  ;GET PIO A MODE 3 MODE WORD
0010:04 D326      ;          OUT    PIOACR  ;OUTPUT PIO A MODE 3 MODE WORD
0012:04 3EB7      ;          MVI     A,OB7H  ;GET PIO A INTERRUPT CONTROL WORD
0014:04 D326      ;          OUT    PIOACR  ;OUTPUT INTERRUPT CONTROL WORD
0016:04 3EEF      ;          MVI     A,OEFH  ;GET PIO A INTERRUPT MASK
0018:04 D326      ;          OUT    PIOACR  ;OUTPUT INTERRUPT MASK
001A:04 3E30      ;          MVI     A,30H   ;GET PIO B DATA DATA WORD
001C:04 D325      ;          OUT    PIOBDR  ;OUTPUT PIO B DATA WORD
001E:04 3E0F      ;          MVI     A,OFH   ;GET PIO B MODE WORD (MODE 0)
0020:04 D327      ;          OUT    PIOBCR  ;OUTPUT PIO B MODE WORD
0022:04 DB20      ;          IN     PORTAD  ;CLEAR INPUT PORT A
0024:04 3A 0000:05 ;          LDA     NMBCKT# ;GET NUMBER OF CIRCUITS
0027:04 47        ;          MOV    B,A     ;NUMBER OF CIRCUITS TO B-REG
0028:04 21 0001:06 ;          LXI    H,CKTAST#+1 ;GET CIRCUIT ASSIGNMENT TABLE
002B:04 3A 0081   ;          LDA     TBUF+1 ;GET MSB OF PASSED DESTINATION ID
002E:04 BE        ;          ..SL:  CMP    M     ;CIRCUIT NUMBERS EQUAL?
002F:04 2807      ;          JRZ   ..DIDF  ;IF SO, CONTINUE
0031:04 23        ;          INX   H       ;ELSE, ADVANCE TO NEXT TABLE ENTRY
0032:04 23        ;          INX   H
0033:04 23        ;          INX   H
0034:04 23        ;          INX   H
0035:04 10F7      ;          DJNZ  ..SL   ;CONTINUE
0037:04 C9        ;          RET                ;DONE
0038:04 2B        ;          ..DIDF: DCX   H   ;BACK UP TO LSB OF DESTINATION ID
0039:04 3A 0080   ;          LDA     TBUF   ;GET LSB OF PASSED DESTINATION ID
003C:04 77        ;          MOV    M,A     ;SET LSB OF DESTINATION ID
003D:04 C9        ;          RET                ;DONE
;
0000'          ;          .LOC      .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' 79          ;          CKTDR%::MOV   A,C   ;GET FUNCTION NUMBER
0001' B7          ;          ORA   A     ;FUNCTION NUMBER=0?
0002' 2804        ;          JRZ   SLVRCV  ;IF SO, CONTINUE
0004' 3D          ;          DCR   A     ;FUNCTION NUMBER=1?
0005' 281C        ;          JRZ   SLVSND  ;IF SO, CONTINUE
0007' C9          ;          RET                ;ELSE, DONE
;
0008' 21 0000"    ;          SLVRCV: LXI   H,RCVSPH ;GET RECEIVE MESSAGE SEMAPHORE
000B' CD 0000:07 ;          CALL  WAIT#  ;WAIT FOR RECEIVE MESSAGE
000E' CD 003B'    ;          CALL  SRMCOM  ;DO COMMON SETUP
0011' 0601        ;          MVI   B,1    ;GET LENGTH OF MESSAGE LENGTH
0013' CD 001A'    ;          CALL  ..RCVL  ;RECEIVE MESSAGE LENGTH
0016' 2B          ;          DCX   H     ;BACK UP TO MESSAGE LENGTH
0017' 46          ;          MOV   B,M     ;GET MESSAGE LENGTH
0018' 23          ;          INX   H     ;RESTORE MESSAGE BUFFER ADDRESS

```

SCD740 - TURBODOS OPERATING SYSTEM SLAVE CIRCUIT DRIVER (IMS 740)
 COPYRIGHT (C) 1982. SOFTWARE 2000, INC.

```

0019' 05          DCR      B          ;DECREMENT MESSAGE LENGTH
001A' CD 005B'   ..RCVL: CALL   INBYT   ;INPUT BYTE
001D' 77          MOV      M,A       ;SAVE BYTE IN MESSAGE
001E' 23          INX      H
001F' 10F9       DJNZ     ..RCVL   ;CONTINUE
0021' AF         XRA      A          ;SET RETURN CODE=0
0022' C9         RET
;
0023' CD 003B'   SLVSND: CALL   SRMCOM  ;DO COMMON SETUP
0026' 3E06       MVI      A,AACK   ;GET ACK
0028' CD 0064'   CALL   OUTBYT  ;OUTPUT ACK
002B' 46         MOV      B,M       ;GET MESSAGE LENGTH
002C' 7E         ..SNDL: MOV   A,M     ;GET BYTE FROM MESSAGE
002D' 23          INX      H
002E' CD 0064'   CALL   OUTBYT  ;OUTPUT BYTE
0031' 10F9       DJNZ     ..SNDL   ;CONTINUE
0033' 21 0000"  LXI      H,RCVSPH ;GET RECEIVE MESSAGE SEMAPHORE
0036' CD 0000:08 CALL   SIGNAL#  ;SIGNAL RECEIVE MESSAGE
0039' AF         XRA      A          ;SET RETURN CODE=0
003A' C9         RET
;
003B' EB         ;SRMCOM: XCHG     ;MESSAGE PACKET ADDRESS TO HL-REG
003C' 23          INX      H          ;ADVANCE PAST LINK POINTERS
003D' 23          INX      H
003E' 23          INX      H
003F' 23          INX      H
0040' C9         RET
;
0041' ED73 0000:09 PIOISR: SSPD   INTSP#  ;SAVE STACK POINTER
0045' 31 0000:0A LXI      SP,INTSTK# ;SET UP AUX STACK POINTER
0048' F5         PUSH   PSW      ;SAVE AF-REG
0049' DB24       IN      PIOADR  ;GET PIO A DATA REGISTER
004B' CB6F       BIT      PORTC5,A ;PORT C BIT 5 SET? (IBF)
004D' 2004       JRNZ   ..X      ;IF SO, CONTINUE
004F' 3E15       MVI      A,ANAK  ;ELSE, GET NACK
0051' D320       OUT     PORTAD  ;OUTPUT NACK TO PORT A
0053' F1         ..X:   POP     PSW      ;RESTORE AF-REG
0054' ED7B 0000:09 LSPD   INTSP#  ;RESTORE STACK POINTER
0058' FB         EI          ;ENABLE INTERRUPTS
0059' ED4D       RETI     ;DONE
;
005B' DB24       ;INBYT: IN      PIOADR  ;GET PIO A DATA REGISTER
005D' CB77       BIT      PORTC7,A ;PORT C BIT 7 SET? (OBF)
005F' 20FA       JRNZ   INBYT  ;IF NOT, WAIT
0061' DB20       IN      PORTAD  ;INPUT BYTE FROM PORT A
0063' C9         RET
;
0064' 4F         ;OUTBYT: MOV     C,A      ;SAVE OUTPUT BYTE IN C-REG
0065' DB24       ..WTL: IN      PIOADR  ;GET PIO A DATA REGISTER
0067' CB6F       BIT      PORTC5,A ;PORT C BIT 5 SET? (IBF)
0069' 20FA       JRNZ   ..WTL  ;IF SO, WAIT
006B' 79         MOV     A,C      ;GET OUTPUT BYTE
006C' D320       OUT     PORTAD  ;OUTPUT BYTE TO PORT A
006E' C9         RET
;

```

PSA Macro Assembler [C12011-0102]

Page 4

SCD740 - TURBODOS OPERATING SYSTEM SLAVE CIRCUIT DRIVER (IMS 740)
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

;
.END

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This module handles all serial and parallel I/O
; * for the IMS 740 slave processor board. The IMS
; * has two serial ports. One is generally used for
; * a console, and the other can be used for a local
; * printer or a modem.
; *
; * Serial input is handled via interrupts and buf-
; * fered in a separate circular buffer for each chan-
; * nel. Serial output is handled on a polled basis
; * and is not buffered.
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT SPD740 ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0010 PIOVEC = 10H ;PIO INTERRUPT VECTOR ADDRESS
0012 SIOVEC = 12H ;SIO INTERRUPT VECTOR ADDRESS
;
0020 PORTAD = 20H ;8255 PORT A DATA REGISTER
0024 PIOADR = 24H ;PIO PORT A DATA REGISTER
0025 PIOBDR = 25H ;PIO PORT B DATA REGISTER
0026 PIOACR = 26H ;PIO PORT A CONTROL REGISTER
0027 PIOBCR = 27H ;PIO PORT B CONTROL REGISTER
0028 CTCCHO = 28H ;CTC CHANNEL 0 REGISTERS
0029 CTCCH1 = 29H ;CTC CHANNEL 1 REGISTERS
002A CTCCH2 = 2AH ;CTC CHANNEL 2 REGISTERS
002B CTCCH3 = 2BH ;CTC CHANNEL 3 REGISTERS
002C SIOADR = 2CH ;SIO PORT A DATA REGISTER
002D SIOBDR = 2DH ;SIO PORT B DATA REGISTER
002E SIOACR = 2EH ;SIO PORT A CONTROL REGISTER
002F SIOBCR = 2FH ;SIO PORT B CONTROL REGISTER
;
0004 PORTC0 = 4 ;PORT C DATA BIT 0 (INT)
0005 PORTC5 = 5 ;PORT C DATA BIT 5 (IBF)
0006 PORTC7 = 6 ;PORT C DATA BIT 7 (OBF)
0007 RAMPER = 7 ;RAM PARITY ERROR
;
0006 ROMENA = 6 ;ROM ENABLE BIT
0007 PERRES = 7 ;PARITY ERROR RESET
;
0000 RDA = 0 ;RECEIVED DATA AVAILABLE BIT
0002 TBE = 2 ;TRANSMIT BUFFER EMPTY BIT

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0003          DCD      = 3          ;DATA CARRIER DETECT BIT
0005          CTS      = 5          ;CLEAR TO SEND BIT
;
0000"         ;          .LOC      .DATA.# ;LOCATE IN DATA AREA
;
0000" 0040     SOIBSZ: .WORD      64      ;SERIAL 0 INPUT BUFFER SIZE
0002" 0000     SOIBUF: .WORD      0       ;SERIAL 0 INPUT BUFFER ADDRESS
0004" 0000     SOIPTR: .WORD      0       ;SERIAL 0 INPUT POINTER
0006" 0000     SOOPTR: .WORD      0       ;SERIAL 0 OUTPUT POINTER
0008" 0000     SOICNT: .WORD      0       ;SERIAL 0 INPUT COUNT
000A" 00       SOOCHR: .BYTE      0       ;SERIAL 0 OUTPUT CHARACTER
000B" 00       SOBR:   .BYTE      0       ;SERIAL 0 BAUD RATE CODE
;
000C"         SOISPH:                ;SERIAL 0 INPUT SEMAPHORE
000C" 0000     .WORD      0             ;SEMAPHORE COUNT
000E" 000E"    ..SOIH: .WORD      ..SOIH ;SEMAPHORE P/D HEAD
0010" 000E"    .WORD      ..SOIH
;
0012" 0000     SOOSPH: .WORD      0             ;SERIAL 0 OUTPUT SEMAPHORE
0014" 0014"    ..SOOH: .WORD      ..SOOH ;SEMAPHORE COUNT
0016" 0014"    .WORD      ..SOOH ;SEMAPHORE P/D HEAD
;
0018" 0001     SOXSPH: .WORD      1             ;SERIAL 0 OUTPUT SEMAPHORE
001A" 001A"    ..SOXH: .WORD      ..SOXH ;SEMAPHORE COUNT
001C" 001A"    .WORD      ..SOXH ;SEMAPHORE P/D HEAD
;
001E" 0010     S1IBSZ: .WORD      16      ;SERIAL 1 INPUT BUFFER SIZE
0020" 0000     S1IBUF: .WORD      0       ;SERIAL 1 INPUT BUFFER ADDRESS
0022" 0000     S1IPTR: .WORD      0       ;SERIAL 1 INPUT POINTER
0024" 0000     S1OPTR: .WORD      0       ;SERIAL 1 OUTPUT POINTER
0026" 0000     S1ICNT: .WORD      0       ;SERIAL 1 INPUT COUNT
0028" 00       S1OCHR: .BYTE      0       ;SERIAL 1 OUTPUT CHARACTER
0029" 00       S1BR:   .BYTE      0       ;SERIAL 1 BAUD RATE CODE
;
002A" 0000     S1ISPH: .WORD      0             ;SERIAL 1 INPUT SEMAPHORE
002C" 002C"    ..S1IH: .WORD      ..S1IH ;SEMAPHORE COUNT
002E" 002C"    .WORD      ..S1IH ;SEMAPHORE P/D HEAD
;
0030" 0000     S1OSPH: .WORD      0             ;SERIAL 1 OUTPUT SEMAPHORE
0032" 0032"    ..S1OH: .WORD      ..S1OH ;SEMAPHORE COUNT
0034" 0032"    .WORD      ..S1OH ;SEMAPHORE P/D HEAD
;
0036" 0001     S1XSPH: .WORD      1             ;SERIAL 1 OUTPUT SEMAPHORE
0038" 0038"    ..S1XH: .WORD      ..S1XH ;SEMAPHORE COUNT
003A" 0038"    .WORD      ..S1XH ;SEMAPHORE P/D HEAD
;
0000:04       ;          .LOC      .INIT.# ;LOCATE IN INITIALIZATION AREA
;
0000:04 AF     SPINIT: .XRA      A

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0001:04 ED47          STAI          ;SET INTERRUPT PAGE REGISTER=0
0003:04 ED5E          IM2           ;SET INTERRUPT MODE 2
0005:04 3ECF          MVI          A,OCFH  ;GET PIO A MODE WORD (MODE 3)
0007:04 D326          OUT          PIOACR  ;OUTPUT PIO A MODE WORD
0009:04 3EFF          MVI          A,OFFH  ;GET PIO A MODE 3 MODE WORD
000B:04 D326          OUT          PIOACR  ;OUTPUT PIO A MODE 3 MODE WORD
000D:04 3E30          MVI          A,30H   ;GET PIO B DATA BYTE
000F:04 D325          OUT          PIOBDR  ;OUTPUT PIO B DATA BYTE
0011:04 3E0F          MVI          A,OFH   ;GET PIO B MODE WORD (MODE 0)
0013:04 D327          OUT          PIOBCR  ;OUTPUT PIO B MODE WORD
0015:04 21 0127'      LXI          H,SIOISR ;GET SIO INTERRUPT SERVICE ADDR
0018:04 22 0012      SHLD        SIOVEC  ;SET SIO INTERRUPT VECTOR ADDRESS
001B:04 21 004A:04    LXI          H,SIOPGM ;GET SIO PROGRAM LIST
001E:04 01 092E      LXI          B,SIOAPL<8!SIOACR ;B=LENGTH/C=CONTROL REG
0021:04 EDB3          OUTIR       ;PROGRAM SIO PORT A
0023:04 21 004A:04    LXI          H,SIOPGM ;GET SIO PROGRAM LIST
0026:04 01 0B2F      LXI          B,SIOBPL<8!SIOBCR ;B=LENGTH/C=CONTROL REG
0029:04 EDB3          OUTIR       ;PROGRAM SIO PORT B
002B:04 2A 0000"      LHL         SOIBSZ  ;GET SERIAL 0 INPUT BUFFER SIZE
002E:04 CD 0000:05    CALL        ALLOC#  ;ALLOCATE PACKET FOR SERIAL BUFFER
0031:04 22 0002"      SHLD        SOIBUF  ;SAVE SERIAL 0 INPUT BUFFER ADDRESS
0034:04 22 0004"      SHLD        SOIPTR  ;SET SERIAL 0 INPUT POINTER
0037:04 22 0006"      SHLD        SOOPTR  ;SET SERIAL 0 OUTPUT POINTER
003A:04 2A 001E"      LHL         S1IBSZ  ;GET SERIAL 1 INPUT BUFFER SIZE
003D:04 CD 0000:05    CALL        ALLOC#  ;ALLOCATE PACKET FOR SERIAL BUFFER
0040:04 22 0020"      SHLD        S1IBUF  ;SAVE SERIAL 1 INPUT BUFFER ADDRESS
0043:04 22 0022"      SHLD        S1IPTR  ;SET SERIAL 1 INPUT POINTER
0046:04 22 0024"      SHLD        S1OPTR  ;SET SERIAL 1 OUTPUT POINTER
0049:04 C9           RET           ;DONE

;
004A:04 18           ;SIOPGM: .BYTE 18H ;RESET CHANNEL
004B:04 04           .BYTE 4 ;SELECT WR4
004C:04 C4           .BYTE 0C4H ;WRITE REGISTER 4 CONTROL WORD
004D:04 05           .BYTE 5 ;SELECT WR5
004E:04 EA           .BYTE 0EAH ;WRITE REGISTER 5 CONTROL WORD
004F:04 03           .BYTE 3 ;SELECT WR3
0050:04 C1           .BYTE 0C1H ;WRITE REGISTER 3 CONTROL WORD
0051:04 01           .BYTE 1 ;SELECT WR1
0052:04 10           .BYTE 10H ;WRITE REGISTER 1 CONTROL WORD

;
0009           SIOAPL = .-SIOPGM ;SIO PORT A PROGRAM LENGTH
;
0053:04 02           .BYTE 2 ;SELECT WR2
0054:04 12           .BYTE SIOVEC ;WRITE REGISTER 1 CONTROL WORD

;
000B           SIOBPL = .-SIOPGM ;SIO PORT B PROGRAM LENGTH
;
0000'          .LOC .PROG.# ;LOCATE IN PROGRAM AREA

;
0000'          SERIAL::
0000' 7B          COMDRV::MOV A,E ;GET FUNCTION NUMBER
0001' B7          ORA A ;FUNCTION NUMBER=0?
0002' 2818       JRZ SERST ;IF SO, CONTINUE
0004' 3D          DCR A ;FUNCTION NUMBER=1?

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0005' 282E          JRZ      SERIN   ;IF SO, CONTINUE
0007' 3D           DCR      A       ;FUNCTION NUMBER=2?
0008' CA 0097'    JZ       SEROUT  ;IF SO, CONTINUE
000B' 3D           DCR      A       ;FUNCTION NUMBER=3?
000C' CA 01F9'    JZ       SERSBR  ;IF SO, CONTINUE
000F' 3D           DCR      A       ;FUNCTION NUMBER=4?
0010' CA 022B'    JZ       SERRBR  ;IF SO, CONTINUE
0013' 3D           DCR      A       ;FUNCTION NUMBER=5?
0014' CA 0237'    JZ       SERSMC  ;IF SO, CONTINUE
0017' 3D           DCR      A       ;FUNCTION NUMBER=6?
0018' CA 0257'    JZ       SERRMC  ;IF SO, CONTINUE
001B' C9          RET      ;ELSE, DONE

;
001C' ED5B 0008"  ;SERST: LDED   SOICNT  ;GET SERIAL 0 INPUT BUFFER COUNT
0020' 2A 0006"   LHL D   SOOPTR  ;GET SERIAL 0 OUTPUT POINTER
0023' 78         MOV    A,B   ;GET CHANNEL NUMBER
0024' B7         ORA    A       ;CHANNEL NUMBER=0
0025' 2807       JRZ    ..COM  ;IF SO, CONTINUE
0027' ED5B 0026" LDED   S1ICNT  ;GET SERIAL 1 INPUT BUFFER COUNT
002B' 2A 0024"   LHL D   S1OPTR  ;GET SERIAL 1 OUTPUT POINTER
002E' 7A         ;..COM: MOV    A,D   E
002F' B3         ORA    E       ;SERIAL INPUT BUFFER COUNT=0?
0030' C8         RZ      ;IF SO, DONE
0031' 3EFF       MVI    A,OFFH ;ELSE, SET RETURN CODE=OFFH
0033' 4E         MOV    C,M   ;GET SERIAL INPUT CHARACTER
0034' C9         RET      ;DONE

;
0035' CD 001C'   ;SERIN: CALL   SERST  ;GET SERIAL STATUS
0038' B7         ORA    A       ;CHARACTER AVAILABLE?
0039' 78         MOV    A,B   ;GET CHANNEL NUMBER
003A' 200E       JRNZ   ..SIN  ;IF CHARACTER AVAILABLE, CONTINUE
003C' 21 000C"   LXI    H,SOISPH ;GET SERIAL 0 INPUT SEMAPHORE
003F' B7         ORA    A       ;CHANNEL NUMBER=0?
0040' 2803       JRZ    ..INC  ;IF SO, CONTINUE
0042' 21 002A"   LXI    H,S1ISPH ;GET SERIAL 1 INPUT SEMAPHORE
0045' CD 0000:06 ;..INC: CALL   WAIT#  ;WAIT FOR INPUT CHARACTER
0048' 18EB       JMPR  SERIN  ;CONTINUE
004A' B7         ;..SIN: ORA    A       ;CHANNEL NUMBER=0?
004B' 2025       JRNZ   ..S1I  ;IF NOT, CONTINUE
004D' F3         DI      ;DISABLE INTERRUPTS
004E' 2A 0008"   LHL D   SOICNT  ;GET SERIAL 0 INPUT COUNT
0051' 2B         DCX    H       ;DECREMENT SERIAL 0 INPUT COUNT
0052' 22 0008"   SHLD  SOICNT  ;UPDATE SERIAL 0 INPUT COUNT
0055' 2A 0006"   LHL D   SOOPTR  ;GET SERIAL 0 OUTPUT POINTER
0058' 7E         MOV    A,M   ;GET CHARACTER FROM BUFFER
0059' 23         INX    H       ;INCREMENT SERIAL 0 OUTPUT POINTER
005A' EB         XCHG  ;SERIAL 0 OUTPUT POINTER TO DE-REG
005B' 2A 0002"   LHL D   SOIBUF  ;GET SERIAL 0 INPUT BUFFER ADDRESS
005E' ED4B 0000" LBCD  SOIBSZ  ;GET SERIAL 0 INPUT BUFFER SIZE
0062' 0B         DCX    B       ;DECREMENT INPUT BUFFER SIZE
0063' 09         DAD    B       ;CALC LAST INPUT BUFFER ADDRESS
0064' ED52       DSBC  D       ;BUFFER WRAP-AROUND?
0066' 3004       JRNC  ..NWA0 ;IF NOT, CONTINUE
0068' ED5B 0002" LDED  SOIBUF  ;GET SERIAL 0 INPUT BUFFER ADDRESS

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

006C' ED53 0006"    ..NWA0: SDED    SOOPTR    ;UPDATE SERIAL 0 OUTPUT POINTER
0070' FB           EI           ;ENABLE INTERRUPTS
0071' C9           RET          ;DONE
0072' F3           ..S1I: DI           ;DISABLE INTERRUPTS
0073' 2A 0026"    LHL D    S1ICNT    ;GET SERIAL 1 INPUT COUNT
0076' 2B           DCX          H        ;DECREMENT SERIAL 1 INPUT COUNT
0077' 22 0026"    SHLD         S1ICNT    ;UPDATE SERIAL 1 INPUT COUNT
007A' 2A 0024"    LHL D    S1OPTR    ;GET SERIAL 1 OUTPUT POINTER
007D' 7E           MOV          A,M      ;GET CHARACTER FROM BUFFER
007E' 23           INX          H        ;INCREMENT SERIAL 1 OUTPUT POINTER
007F' EB           XCHG         ;SERIAL 1 OUTPUT POINTER TO DE-REG
0080' 2A 0020"    LHL D    S1IBUF    ;GET SERIAL 1 INPUT BUFFER ADDRESS
0083' ED4B 001E"  LBCD         S1IBSZ    ;GET SERIAL 1 INPUT BUFFER SIZE
0087' 0B           DCX          B        ;DECREMENT INPUT BUFFER SIZE
0088' 09           DAD          B        ;CALC LAST INPUT BUFFER ADDRESS
0089' ED52         DSBC         D        ;BUFFER WRAP-AROUND?
008B' 3004         JRNC         ..NWA1    ;IF NOT, CONTINUE
008D' ED5B 0020"  LDED         S1IBUF    ;GET SERIAL 1 INPUT BUFFER ADDRESS
0091' ED53 0024"  ..NWA1: SDED    S1OPTR    ;UPDATE SERIAL 1 OUTPUT POINTER
0095' FB           EI           ;ENABLE INTERRUPTS
0096' C9           RET          ;DONE

;
SEROUT: MOV        A,B        ;GET CHANNEL NUMBER
0097' 78           ORA          A        ;CHANNEL NUMBER=1?
0098' B7           JRNZ         ..S10    ;IF SO, CONTINUE
0099' 201E         LXI          H,SOXSPH ;GET SERIAL 0 OUT SEMAPHORE
009B' 21 0018"    PUSH         H        ;SAVE SERIAL 0 OUT SEMAPHORE
009E' E5           CALL         WAIT#    ;WAIT ON MUTUAL EXCLUSION
009F' CD 0000:06  LXI          H,SOOCHR ;GET SERIAL 0 OUTPUT CHARACTER
00A2' 21 000A"    MOV          M,C      ;SAVE OUTPUT CHARACTER
00A5' 71           LXI          D,SOOPOL ;GET SERIAL 0 OUT POLL ROUTINE
00A6' 11 00D7'    CALL         LNKPOL# ;CREATE POLL ROUTINE
00A9' CD 0000:07  CALL         SOOPR    ;EXECUTE POLL ROUTINE
00AC' CD 00DB'    LXI          H,SOOSPH ;GET SERIAL 0 OUT SEMAPHORE
00AF' 21 0012"    CALL         WAIT#    ;DISPATCH IF NECESSARY
00B2' CD 0000:06  POP          H        ;GET MUTUAL EXCLUSION SEMAPHORE
00B5' E1           JMP          SIGNAL#  ;SIGNAL PROCESS AS READY
00B6' C3 0000:08  ..S10: LXI          H,S1XSPH ;GET MUTUAL EXCLUSION SEMAPHORE
00B9' 21 0036"    PUSH         H        ;SAVE MUTUAL EXCLUSION SEMAPHORE
00BC' E5           CALL         WAIT#    ;WAIT ON MUTUAL EXCLUSION
00BD' CD 0000:06  LXI          H,S1OCHR ;GET SERIAL 1 OUTPUT CHARACTER
00C0' 21 0028"    MOV          M,C      ;SAVE OUTPUT CHARACTER
00C3' 71           LXI          D,S1OPOL ;GET SERIAL 1 OUT POLL ROUTINE
00C4' 11 00FF'    CALL         LNKPOL# ;CREATE POLL ROUTINE
00C7' CD 0000:07  CALL         S1OPR    ;EXECUTE POLL ROUTINE
00CA' CD 0103'    LXI          H,S1OSPH ;GET SERIAL 1 OUT SEMAPHORE
00CD' 21 0030"    CALL         WAIT#    ;DISPATCH IF NECESSARY
00D0' CD 0000:06  POP          H        ;GET MUTUAL EXCLUSION SEMAPHORE
00D3' E1           JMP          SIGNAL#  ;SIGNAL PROCESS AS READY
00D4' C3 0000:08

;
SOOPOL: ;SERIAL 0 OUTPUT POLL ROUTINE
00D7' 0000         .WORD      0        ;SUCCESSOR LINK POINTER
00D9' 0000         .WORD      0        ;PREDECESSOR LINK POINTER
;

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

00DB' 3E10          SOOPR: MVI    A,10H    ;GET RESET EXTERNAL STATUS COMMAND
00DD' D32E          OUT     SIOACR   ;RESET EXTERNAL STATUS
00DF' DB2E          IN      SIOACR   ;GET SIO PORT A STATUS
00E1' CB57          BIT     TBE,A    ;TRANSMIT BUFFER EMPTY?
00E3' C8            RZ           ;IF NOT, DONE
00E4' 21 000B"     LXI     H,SOBR   ;ELSE, GET SERIAL 0 BAUD RATE CODE
00E7' CB76          BIT     6,M     ;CTS HANDSHAKING REQUESTED?
00E9' 2803          JRZ     ..NCTS  ;IF NOT, CONTINUE
00EB' CB6F          BIT     CTS,A   ;ELSE, CHECK CLEAR TO SEND STATUS
00ED' C8            RZ           ;IF CLEAR TO SEND FALSE, DONE
00EE' 3A 000A"     ..NCTS: LDA    SOOCHR  ;GET SERIAL 0 OUTPUT CHARACTER
00F1' D32C          OUT     SIOADR  ;OUTPUT CHARACTER
00F3' 21 00D7'     LXI     H,SOOPOL ;GET SERIAL 0 OUT POLL ROUTINE
00F6' CD 0000:09   CALL   UNLINK# ;UNLINK POLL ROUTINE
00F9' 21 0012"     LXI     H,SOOSPH ;GET SERIAL 0 OUT SEMAPHORE
00FC' C3 0000:08   JMP     SIGNAL# ;SIGNAL PROCESS AS READY

;
00FF'              ;S1OPOL:
00FF' 0000          .WORD   0        ;SERIAL 1 OUTPUT POLL ROUTINE
0101' 0000          .WORD   0        ;SUCCESSOR LINK POINTER
                                ;PREDECESSOR LINK POINTER

;
0103' 3E10          ;S1OPR: MVI    A,10H    ;GET RESET EXTERNAL STATUS COMMAND
0105' D32F          OUT     SIOBCR   ;RESET EXTERNAL STATUS
0107' DB2F          IN      SIOBCR   ;GET SIO PORT B STATUS
0109' CB57          BIT     TBE,A    ;TRANSMIT BUFFER EMPTY?
010B' C8            RZ           ;IF NOT, DONE
010C' 21 0029"     LXI     H,S1BR   ;ELSE, GET SERIAL 1 BAUD RATE CODE
010F' CB76          BIT     6,M     ;CTS HANDSHAKING REQUESTED?
0111' 2803          JRZ     ..NCTS  ;IF NOT, CONTINUE
0113' CB6F          BIT     CTS,A   ;ELSE, CHECK CLEAR TO SEND STATUS
0115' C8            RZ           ;IF CLEAR TO SEND FALSE, DONE
0116' 3A 0028"     ..NCTS: LDA    S1OCHR  ;GET SERIAL 1 OUTPUT CHARACTER
0119' D32D          OUT     SIOBDR  ;OUTPUT CHARACTER
011B' 21 00FF'     LXI     H,S1OPOL ;GET SERIAL 1 OUT POLL ROUTINE
011E' CD 0000:09   CALL   UNLINK# ;UNLINK POLL ROUTINE
0121' 21 0030"     LXI     H,S1OSPH ;GET SERIAL 1 OUT SEMAPHORE
0124' C3 0000:08   JMP     SIGNAL# ;SIGNAL PROCESS AS READY

;
0127' ED73 0000:0A ;S1OISR: SSPD   INTSP#  ;SAVE STACK POINTER
012B' 31 0000:0B   LXI     SP,INTSTK# ;SET UP AUX STACK POINTER
012E' F5            PUSH   PSW     ;SAVE REGISTERS
012F' C5            PUSH   B
0130' D5            PUSH   D
0131' E5            PUSH   H
0132' CD 0143'     CALL   ..SOI   ;CHECK FOR SERIAL 0 INPUT
0135' CD 019C'     CALL   ..S1I   ;CHECK FOR SERIAL 1 INPUT
0138' E1            POP    H      ;RESTORE REGISTERS
0139' D1            POP    D
013A' C1            POP    B
013B' F1            POP    PSW
013C' ED7B 0000:0A LSPD   INTSP#  ;RESTORE STACK POINTER
0140' C3 0000:0C   JMP     ISRXIT# ;CONTINUE
0143' DB2E          ..SOI: IN     SIOACR  ;GET SIO PORT A STATUS
0145' CB47          BIT     RDA,A   ;CHARACTER AVAILABLE

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0147' C8 RZ ;IF NOT, DONE
0148' DB2C IN SIOADR ;GET SIO PORT A DATA CHARACTER
014A' 21 000B" LXI H,SOBR ;GET SERIAL 0 BAUD RATE CODE
014D' CB6E BIT 5,M ;INHIBIT INPUT FLAG SET?
014F' C0 RNZ ;IF SO, DONE
0150' 4F MOV C,A ;SERIAL 0 DATA CHARACTER TO C-REG
0151' CB7E BIT 7,M ;SIGN BIT ON BAUD RATE CODE?
0153' 2817 JRZ ..NADO ;IF NOT, CONTINUE
0155' CBB9 RES 7,C ;ELSE, STRIP SIGN BIT ON CHARACTER
0157' CD 0000:0D CALL SLVRES# ;CHECK FOR SLAVE RESET
015A' 3A 0000:0E LDA ATNCHR# ;GET ATTENTION CHARACTER
015D' B9 CMP C ;CHARACTER=ATTENTION CHARACTER?
015E' 200C JRNZ ..NADO ;IF NOT, CONTINUE
0160' 2A 0004" LHL D SOIPTR ;ELSE, GET SERIAL 0 INPUT POINTER
0163' 22 0006" SHLD SOOPTR ;RESET SERIAL 0 OUTPUT POINTER
0166' 21 0000 LXI H,0
0169' 22 0008" SHLD SOICNT ;SET SERIAL 0 INPUT COUNT=0
016C' 2A 0000" ..NADO: LHL D SOIBSZ ;GET SERIAL 0 INPUT BUFFER SIZE
016F' ED5B 0008" LDED SOICNT ;GET SERIAL 0 INPUT COUNT
0173' 13 INX D ;INCREMENT SERIAL 0 INPUT COUNT
0174' B7 ORA A ;CLEAR CARRY FLAG
0175' ED52 DSBC D ;SERIAL 0 INPUT BUFFER FULL?
0177' D8 RC ;IF SO, DONE
0178' ED53 0008" SDED SOICNT ;ELSE, UPDATE SERIAL 0 INPUT COUNT
017C' 2A 0004" LHL D SOIPTR ;GET SERIAL 0 INPUT POINTER
017F' 71 MOV M,C ;STORE INPUT CHARACTER IN BUFFER
0180' 23 INX H ;INCREMENT INPUT POINTER
0181' EB XCHG ;INPUT POINTER TO DE-REG
0182' 2A 0000" LHL D SOIBSZ ;GET SERIAL 0 INPUT BUFFER SIZE
0185' 2B DCX H ;DECREMENT INPUT BUFFER SIZE
0186' ED4B 0002" LBCD SOIBUF ;GET SERIAL 0 INPUT BUFFER ADDRESS
018A' 09 DAD B ;CALC LAST INPUT BUFFER ADDRESS
018B' ED52 DSBC D ;BUFFER WRAP-AROUND?
018D' 3004 JRNC ..NWA0 ;IF NOT, CONTINUE
018F' ED5B 0002" LDED SOIBUF ;GET SERIAL 0 INPUT BUFFER ADDRESS
0193' ED53 0004" ..NWA0: SDED SOIPTR ;UPDATE SERIAL 0 INPUT POINTER
0197' 21 000C" LXI H,SOISPH ;GET SERIAL 0 INPUT SEMAPHORE
019A' 1857 JMPR ..X ;CONTINUE
019C' DB2F ..S1I: IN SIOBCR ;GET SIO PORT B STATUS
019E' CB47 BIT RDA,A ;CHARACTER AVAILABLE
01A0' C8 RZ ;IF NOT, DONE
01A1' DB2D IN SIOBDR ;GET SIO PORT B DATA CHARACTER
01A3' 21 0029" LXI H,S1BR ;GET SERIAL 1 BAUD RATE CODE
01A6' CB6E BIT 5,M ;INHIBIT INPUT FLAG SET?
01A8' C0 RNZ ;IF SO, DONE
01A9' 4F MOV C,A ;SERIAL 1 DATA CHARACTER TO C-REG
01AA' CB7E BIT 7,M ;ATTENTION DETECTION FLAG SET?
01AC' 2817 JRZ ..NAD1 ;IF NOT, CONTINUE
01AE' CBB9 RES 7,C ;ELSE, STRIP SIGN BIT ON CHARACTER
01B0' CD 0000:0D CALL SLVRES# ;CHECK FOR SLAVE RESET
01B3' 3A 0000:0E LDA ATNCHR# ;GET ATTENTION CHARACTER
01B6' B9 CMP C ;CHARACTER=ATTENTION CHARACTER?
01B7' 200C JRNZ ..NAD1 ;IF NOT, CONTINUE
01B9' 2A 0022" LHL D S1IPTR ;ELSE, GET SERIAL 1 INPUT POINTER

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

01BC' 22 0024"      SHLD  S1OPTR ;RESET SERIAL 1 OUTPUT POINTER
01BF' 21 0000      LXI   H,0
01C2' 22 0026"      SHLD  S1ICNT ;SET SERIAL 1 INPUT COUNT=0
01C5' 2A 001E"      ..NAD1: LHL  S1IBSZ ;GET SERIAL 1 INPUT BUFFER SIZE
01C8' ED5B 0026"    LDED  S1ICNT ;GET SERIAL 1 INPUT COUNT
01CC' 13          INX   D ;INCREMENT SERIAL 1 INPUT COUNT
01CD' B7          ORA   A ;CLEAR CARRY FLAG
01CE' ED52        DSBC  D ;SERIAL 1 INPUT BUFFER FULL?
01D0' D8          RC    ;IF SO, DONE
01D1' ED53 0026"    SDED  S1ICNT ;ELSE, UPDATE SERIAL 1 INPUT COUNT
01D5' 2A 0022"    LHL  S1IPTR ;GET SERIAL 1 INPUT POINTER
01D8' 71          MOV   M,C ;STORE INPUT CHARACTER IN BUFFER
01D9' 23          INX   H ;INCREMENT INPUT POINTER
01DA' EB          XCHG  ;INPUT POINTER TO DE-REG
01DB' 2A 001E"    LHL  S1IBSZ ;GET SERIAL 1 INPUT BUFFER SIZE
01DE' 2B          DCX   H ;DECREMENT INPUT BUFFER SIZE
01DF' ED4B 0020"    LBCD  S1IBUF ;GET SERIAL 1 INPUT BUFFER ADDRESS
01E3' 09          DAD   B ;CALC LAST INPUT BUFFER ADDRESS
01E4' ED52        DSBC  D ;BUFFER WRAP-AROUND?
01E6' 3004        JRNC  ..NWA1 ;IF NOT, CONTINUE
01E8' ED5B 0020"    LDED  S1IBUF ;GET SERIAL 1 INPUT BUFFER ADDRESS
01EC' ED53 0022"    ..NWA1: SDED  S1IPTR ;UPDATE SERIAL 1 INPUT POINTER
01F0' 21 002A"    LXI   H,S1ISPH ;GET SERIAL 1 INPUT SEMAPHORE
01F3' 7E          ..X:  MOV   A,M ;GET SEMAPHORE COUNT
01F4' B7          ORA   A ;SEMAPHORE COUNT=0?
01F5' C8          RZ    ;IF SO, DONE
01F6' C3 0000:08  JMP   SIGNAL# ;ELSE, SIGNAL PROCESS AS READY

;
01F9' 51          ;SERSBR: MOV   D,C ;REQUESTED BAUD RATE TO D-REG
01FA' 21 000B"    LXI   H,SOBR ;GET SERIAL 0 BAUD RATE
01FD' 0E28        MVI   C,CTCCHO ;GET CTC CHANNEL 0 REGISTERS
01FF' 78          MOV   A,B ;GET CHANNEL NUMBER
0200' B7          ORA   A ;CHANNEL NUMBER=0?
0201' 2805        JRZ   ..COM ;IF SO, CONTINUE
0203' 21 0029"    LXI   H,S1BR ;ELSE, GET SERIAL 1 BAUD RATE
0206' 0E29        MVI   C,CTCCH1 ;GET CTC CHANNEL 1 REGISTERS
0208' 72          ..COM: MOV   M,D ;SAVE BAUD RATE CODE
0209' 3E47        MVI   A,47H ;GET CTC CHANNEL CONTROL WORD
020B' ED79        OUTF  A ;INITIALIZE CTC CHANNEL
020D' 7A          MOV   A,D ;GET REQUESTED BAUD RATE CODE
020E' E60F        ANI   OFH ;LIMIT TO 16 BAUD RATES
0210' 5F          MOV   E,A ;TO E-REG
0211' 1600        MVI   D,0 ;MAKE IT DOUBLE LENGTH
0213' 21 021B'    LXI   H,BRTBL ;GET BAUD RATE TABLE
0216' 19          DAD   D ;INDEX INTO TABLE
0217' 7E          MOV   A,M ;GET TIMER VALUE
0218' ED79        OUTF  A ;SET CTC CHANNEL TIME CONSTANT
021A' C9          RET   ;DONE

;
021B' 00          BRTBL: .BYTE 0 ;50 BAUD TIMER VALUE
021C' 00          .BYTE 0 ;75 BAUD TIMER VALUE
021D' AF          .BYTE 175 ;110 BAUD TIMER VALUE
021E' 8F          .BYTE 143 ;134.5 BAUD TIMER VALUE
021F' 80          .BYTE 128 ;150 BAUD TIMER VALUE

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0220' 40          .BYTE 64      ;300 BAUD TIMER VALUE
0221' 20          .BYTE 32      ;600 BAUD TIMER VALUE
0222' 10          .BYTE 16      ;1200 BAUD TIMER VALUE
0223' 0B          .BYTE 11      ;1800 BAUD TIMER VALUE
0224' 0A          .BYTE 10      ;2000 BAUD TIMER VALUE
0225' 08          .BYTE 8       ;2400 BAUD TIMER VALUE
0226' 05          .BYTE 5       ;3600 BAUD TIMER VALUE
0227' 04          .BYTE 4       ;4800 BAUD TIMER VALUE
0228' 03          .BYTE 3       ;7200 BAUD TIMER VALUE
0229' 02          .BYTE 2       ;9600 BAUD TIMER VALUE
022A' 01          .BYTE 1       ;19200 BAUD TIMER VALUE

;
022B' 78          SERRBR: MOV    A,B      ;GET CHANNEL NUMBER
022C' 21 000B"   LXI    H,SOBR  ;GET SERIAL 0 BAUD RATE
022F' B7         ORA    A          ;CHANNEL NUMBER=0?
0230' 2803      JRZ    ..COM      ;IF SO, CONTINUE
0232' 21 0029"   LXI    H,S1BR  ;ELSE, GET SERIAL 1 BAUD RATE
0235' 7E         ..COM: MOV    A,M      ;GET CURRENT BAUD RATE CODE
0236' C9        RET              ;DONE

;
0237' 3EEA      SERSMC: MVI    A,OEAH  ;GET WRITE REGISTER 5 CONTROL WORD
0239' E67D      ANI    #82H      ;STRIP RTS/CTS CONTROL BITS
023B' CB79      BIT    7,C        ;RTS REQUESTED?
023D' 2802      JRZ    ..NRTS
023F' CBCF      SET    1,A        ;IF SO, SET RTS BIT
0241' CB71      ..NRTS: BIT    6,C        ;DTR REQUESTED?
0243' 2802      JRZ    ..NDTR
0245' CBFF      SET    7,A        ;IF SO, SET DTR BIT
0247' 57        ..NDTR: MOV    D,A        ;REQUESTED MODEM CONTROLS TO D-REG
0248' 0E2E      MVI    C,SIOACR ;GET SIO PORT A CONTROL REGISTER
024A' 78        MOV    A,B        ;GET CHANNEL NUMBER
024B' B7        ORA    A          ;CHANNEL NUMBER=0?
024C' 2802      JRZ    ..COM      ;IF SO, CONTINUE
024E' 0E2F      MVI    C,SIOBCR ;GET SIO PORT B CONTROL REGISTER
0250' 3E05      ..COM: MVI    A,5      ;SELECT WRITE REGISTER 5
0252' ED79      OUTP   A          ;
0254' ED51      OUTP   D          ;OUTPUT WRITE REGISTER 5 CONTROL W
D
0256' C9        RET              ;DONE

;
0257' 0E2E      SERRMC: MVI    C,SIOACR ;GET SIO PORT A CONTROL REGISTER
0259' 78        MOV    A,B        ;GET CHANNEL NUMBER
025A' B7        ORA    A          ;CHANNEL NUMBER=0?
025B' 2802      JRZ    ..COM      ;IF SO, CONTINUE
025D' 0E2F      MVI    C,SIOBCR ;GET SIO PORT B CONTROL REGISTER
025F' 3E10      ..COM: MVI    A,10H     ;GET RESET EXTERNAL STATUS COMMAND
0261' ED79      OUTP   A          ;RESET EXTERNAL STATUS
0263' ED50      INP    D          ;GET SIO MODEM STATUS
0265' AF        XRA    A          ;CLEAR RETURN VECTOR
0266' CB6A      BIT    CTS,D      ;CTS SET?
0268' 2802      JRZ    ..NCTS     ;IF NOT, CONTINUE
026A' CBFF      SET    7,A        ;ELSE, SET CTS BIT
026C' CB5A      ..NCTS: BIT    DCD,D    ;DCD SET?
026E' C8        RZ              ;IF NOT, DONE

```

SPD740 - TURBODOS OPERATING SYSTEM SERIAL/PARALLEL DRIVER (IMS 740)
COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```
026F'   CBEF           SET     5,A       ;ELSE, SET DCD BIT
0271'   C9             RET                    ;DONE
;
.END
```

SLVRES - TURBODOS OPERATING SYSTEM SLAVE RESET PROCESSOR
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This is a subroutine called by SPD740 which de-
; * tects two consecutive slave reset characters from
; * the console keyboard, and forces a crash which
; * ultimately causes the slave to be reset by the
; * master.
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT SLVRES          ;MODULE ID
;
; INSERT DREQUATE       ;DRIVER SYMBOLIC EQUIVALENCES
;
0000"                .LOC    .DATA.# ;LOCATE IN DATA AREA
;
0000"    1F          SLRCHR: .BYTE  AUS    ;SLAVE RESET CHARACTER
0001"    FE          RCCNT:  .BYTE  -2    ;RESET CHARACTER COUNT
;
0000'                .LOC    .PROG.# ;LOCATE IN PROGRAM AREA
;
0000'    21 0001"    SLVRES: LXI    H,RCCNT ;GET RESET CHARACTER COUNT
0003'    3A 0000"    LDA    SLRCHR ;GET SLAVE RESET CHARACTER
0006'    B9          CMP    C        ;CHARACTER=SLAVE RESET CHARACTER?
0007'    2803       JRZ    ..RC     ;IF SO, CONTINUE
0009'    36FE       MVI    M,-2     ;ELSE, RESET CHARACTER COUNT
000B'    C9          RET            ;DONE
000C'    34          ..RC: INR    M    ;INCREMENT RESET CHARACTER COUNT
000D'    C0          RNZ            ;IF CHARACTER COUNT NOT=0, DONE
000E'    F3          DI            ;ELSE, DISABLE INTERRUPTS
000F'    76          HLT           ;HALT
;
; .END
    
```

MPB401 - TURBODOS OPERATING SYSTEM MASTER PROCESSOR BOOT FOR IMS 401
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This is a boot ROM driver module which interfaces *
; * with the IMS 401 eight-inch floppy disk controller *
; * board. This driver is linked together with two *
; * other modules, OSBOOT.REL and DST8F.REL, to create *
; * a boot ROM for an IMS 8000 system. *
; *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; .IDENT MPB401 ;MODULE ID
;
; .INSERT EQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0080 RAM =: TBUF ;WORKING STORAGE ADDRESS
0040 RAMLEN = 64 ;WORKING STORAGE LENGTH
;
0082 CH1DMA = 82H ;CHANNEL 1 DMA REGISTER (FDC)
0083 CH1TC = 83H ;CHANNEL 1 TERMINAL COUNT (FDC)
0088 DMACTL = 88H ;DMA COMMAND AND STATUS REGISTERS
008A DSKSEL = 8AH ;DISK SELECT PORT
008C DSKCTL = 8CH ;STATUS AND INT MASK (BOARD)
008E FDCST = 8EH ;DISK CONTROLLER STATUS (uPD-765)
008F FDCDAT = 8FH ;DISK CONTROLLER DATA (uPD-765)
;
0042 CH1ENA = 42H ;DMA CHANNEL 1 ENABLE COMMAND
0000 DMAVfy = 00H ;DMA VERIFY COMMAND
0040 DMARD = 40H ;DMA READ COMMAND
0080 DMAWR = 80H ;DMA WRITE COMMAND
;
0003 FDCSFY = 03H ;FDC SPECIFY COMMAND
0004 FDCSDS = 04H ;FDC SENSE DRIVE STATUS COMMAND
0007 FDCRCL = 07H ;FDC RECALIBRATE COMMAND
0008 FDCSIS = 08H ;FDC SENSE INTERRUPT STATUS COMMAND
000A FDCRID = 0AH ;FDC READ ID COMMAND
000F FDCSK = 0FH ;FDC SEEK COMMAND
0085 FDCWR = 85H ;FDC WRITE COMMAND
0086 FDCRD = 86H ;FDC READ COMMAND
;
0000 DSKENI = 0 ;DISK CONTROLLER ENABLE INTERRUPTS
0007 DSKDLC = 7 ;DISK CONTROLLER DELAY COMPLETE
;
0006 FDCMFM = 6 ;FDC DOUBLE-DENSITY BIT
;
0004 FDCBSY = 4 ;FDC BUSY STATUS
0005 FDCSE = 5 ;FDC SEEK END
    
```

MPB401 - TURBODOS OPERATING SYSTEM MASTER PROCESSOR BOOT FOR IMS 401
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0006          FDCOUT = 6          ;FDC OUTPUT MODE
0007          FDCRDY = 7          ;FDC READY FOR DATA
;
00C0          SRT5  = (16-4)<4    ;5 INCH FDD STEP RATE (4 MS-MINI)
00A0          SRT8S = (16-6)<4    ;8 INCH FDD STEP RATE (6 MS-SHUGAR)
;
00D0          SRT8R = (16-3)<4    ;8 INCH FDD STEP RATE (3 MS-REMEX)
00F0          SRT8P = (16-1)<4    ;8 INCH FDD STEP RATE (1 MS-PERSCI)
;
0024          HLT   = 18*2        ;FDD HEAD LOAD TIME (36 MS)
0001          HUT   = 1          ;FDD HEAD UNLOAD TIME (16 MS)
;
0003          STONR = 3          ;STATUS REGISTER 0 NOT READY
0004          STOEC = 4          ;STATUS REGISTER 0 EQUIP CHECK
0005          STOSE = 5          ;STATUS REGISTER 0 SEEK END
;
0000          ST1MA = 0          ;STATUS REGISTER 1 MISSING ADDR MK
0001          ST1NW = 1          ;STATUS REGISTER 1 NOT WRITABLE
0002          ST1ND = 2          ;STATUS REGISTER 1 NO DATA
0004          ST1OR = 4          ;STATUS REGISTER 1 OVER RUN
0005          ST1DE = 5          ;STATUS REGISTER 1 DATA ERROR
;
0003          ST3TS = 3          ;STATUS REGISTER 3 TWO-SIDED
0004          ST3TO = 4          ;STATUS REGISTER 3 TRACK 0
0005          ST3RDY = 5         ;STATUS REGISTER 3 READY
0006          ST3WP = 6          ;STATUS REGISTER 3 WRITE PROTECTED
;
0002          TSD   = 2          ;TWO-SIDED DISK BIT (TYPE CODE)
0003          DDD   = 3          ;DOUBLE DENSITY DISK BIT (TYPE COD)
;
000A          MAXTRY = 10         ;MAX TRY COUNT
;
00C0          .LOC   RAM+RAMLEN  ;LOCATE IN WORKING STORAGE ARE
;
00C0          IODSK: .BLKB  1    ;DISK NUMBER
00C1          IOTRK: .BLKW  1    ;TRACK NUMBER
00C3          IOSEC: .BLKW  1    ;SECTOR NUMBER
00C5          IODMA: .BLKW  1    ;DMA ADDRESS
00C7          ST3REG: .BLKB  1    ;STATUS REGISTER 3
00C8          TRYCNT: .BLKB  1    ;TRY COUNT
;
00C9          DSKNFO:          ;DISK TYPE INFORMATION
00C9          BLKSIZ: .BLKB  1    ;BLOCK SIZE
00CA          NMBLKS: .BLKW  1    ;NUMBER OF BLOCKS
00CC          NMBDIR: .BLKB  1    ;NUMBER OF DIRECTORY BLOCKS
00CD          SECSIZ: .BLKB  1    ;PHYSICAL SECTOR SIZE (2^N*128)
00CE          SECTRK: .BLKW  1    ;PHYSICAL SECTORS PER TRACK
00D0          TRKDSK: .BLKW  1    ;PHYSICAL TRACKS PER DISK
00D2          RESTRK: .BLKW  1    ;NUMBER OF RESERVED TRACKS
00D4          XLTBL: .BLKW  1    ;TRANSLATION TABLE ADDRESS
00D6          TYPCOD: .BLKB  1    ;DISK TYPE CODE
00D7          GAPLEN: .BLKB  1    ;GAP LENGTH
00DF          DNFOL  = .-DSKNFO  ;DISK INFO LENGTH

```

MPB401 - TURBODOS OPERATING SYSTEM MASTER PROCESSOR BOOT FOR IMS 401
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0000'          ;          .LOC      .PROG.# ;LOCATE IN PROGRAM AREA
          ;
0000' 3E03          INIT:: MVI      A,FDCSFY ;GET FDC SPECIFY COMMAND
0002' CD 01B3'     CALL      DATOUT ;OUTPUT FDC SPECIFY COMMAND
0005' 3EA1          MVI      A,SRT8SHUT ;GET STEP RATE/HEAD UNLTD TIME
0007' CD 01B3'     CALL      DATOUT ;OUTPUT STEP RATE/HEAD UNLTD TIME
000A' 3E24          MVI      A,HLT ;GET HEAD LOAD TIME/NON-DMA BIT
000C' CD 01B3'     CALL      DATOUT ;OUTPUT HEAD LOAD TIME/NON-DMA BIT
000F' 21 0100      LXI      H,TPA ;GET LOAD BASE ADDRESS
0012' C9           RET          ;DONE

          ;
0013' FE04          SELECT:: CPI      4 ;TEST FOR VALID DRIVE
0015' 3061          JRNC     ..NR ;IF INVALID DRIVE, CONTINUE
0017' 32 00C0      STA      IODSK ;ELSE, SET DISK NUMBER
001A' 4F           MOV      C,A ;DISK NUMBER TO C-REG
001B' DB8C          IN       DSKCTL ;GET DISK CONTROLLER STATUS
001D' 0F           RRC      ;EXTRACT SELECTED DRIVE
001E' E603          ANI      3
0020' B9           CMP      C ;DRIVE ALREADY SELECTED?
0021' 2803          JRZ      ..DS ;IF SO, CONTINUE
0023' 79           MOV      A,C ;ELSE, GET DISK NUMBER
0024' D38A          OUT      DSKSEL ;SELECT DISK NUMBER
0026' 01 0014      ..DS: LXI      B,20 ;DELAY 10 MILLISECONDS
0029' 10FE          ..DLY: DJNZ     ..DLY
002B' 0D           DCR      C
002C' 20FB          JRNZ     ..DLY
002E' 3E04          MVI      A,FDCSDS ;GET FDC SENSE DRIVE STATUS CMD
0030' CD 01B3'     CALL      DATOUT ;OUTPUT COMMAND TO FDC
0033' 3A 00C0      LDA      IODSK ;GET DISK NUMBER
0036' CD 01B3'     CALL      DATOUT ;OUTPUT IT TO FDC
0039' CD 01A7'     CALL      DATAIN ;GET STATUS REGISTER 3
003C' CB6F          BIT      ST3RDY,A ;DRIVE READY?
003E' 2838          JRZ      ..NR ;IF NOT READY, CONTINUE
0040' 32 00C7      STA      ST3REG ;ELSE, SAVE STATUS REGISTER 3
0043' CD 0165'     CALL      RECAL ;RECALIBRATE DRIVE
0046' 2030          JRNZ     ..NR ;IF ERRORS, CONTINUE
0048' 0E00          MVI      C,0 ;ELSE, GET INITIAL TYPE VALUE
004A' 21 00C7      LXI      H,ST3REG ;GET STATUS REGISTER 3
004D' CB5E          BIT      ST3TS,M ;ONE-SIDED DISK?
004F' 2802          JRZ      ..OSD ;YES
0051' CBD1          SET      TSD,C ;SET TWO-SIDED DISK BIT
0053' 3E0A          ..OSD: MVI      A,FDCRID ;GET FDC READ ID COMMAND (SD)
0055' CD 0089'     CALL      ..RID ;ATTEMPT TO READ SINGLE-DENSITY
0058' 2809          JRZ      ..TPC ;IF SINGLE-DENSITY, DONE
005A' 3E4A          MVI      A,FDCRID!1<FDCMFM ;GET READ ID CMD (DD)
005C' CD 0089'     CALL      ..RID ;ATTEMPT TO READ DOUBLE-DENSITY
005F' 2017          JRNZ     ..NR ;IF NOT DOUBLE-DENSITY, DONE
0061' CBD9          SET      DDD,C ;SET DOUBLE-DENSITY DISK BIT
0063' B1           ..TPC: ORA      C ;ADD SECTOR SIZE TO TYPE CODE
0064' 4F           MOV      C,A ;SAVE TYPE CODE IN C-REG
0065' 11 0000:04   LXI      D,DSTBLS# ;GET DST BASE ADDRESS
0068' 79           ..SL: MOV      A,C ;GET DISK TYPE CODE
0069' 21 0000:05   LXI      H,DTCO# ;GET OFFSET TO DISK TYPE CODE

```

MPB401 - TURBODOS OPERATING SYSTEM MASTER PROCESSOR BOOT FOR IMS 401
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

006C' 19          DAD      D          ;CALC DISK TYPE CODE ADDRESS
006D' BE          CMP      M          ;DST FOUND?
006E' EB          XCHG     JNZ      H          ;DST ADDRESS TO HL-REG
006F' 2809        JRZ      ..DSTF ;IF DST FOUND, CONTINUE
0071' 5E          MOV      E,M       ;ELSE, GET NEXT DST ADDRESS
0072' 23          INX      H
0073' 56          MOV      D,M
0074' 7A          MOV      A,D
0075' B3          ORA      E          ;END OF LIST?
0076' 20F0        JRNZ     ..SL   ;IF NOT, CONTINUE
0078' AF          ..NR:   XRA      A          ;SET RETURN CODE=0
0079' C9          RET
007A' 23          ..DSTF: INX      H          ;ADVANCE PAST LINK POINTER
007B' 23          INX      H
007C' E5          PUSH     H          ;SAVE DST ADDRESS
007D' 11 00C9     LXI      D,DSKNFO ;GET DISK INFO WORK AREA
0080' 01 000F     LXI      B,DNFOL  ;GET DISK INFO LENGTH
0083' ED80        LDIR     ;COPY DST INTO WORK AREA
0085' E1          POP      H          ;RESTORE DST ADDRESS
0086' 3EFF        MVI      A,OFFH  ;SET RETURN CODE=OFFH
0088' C9          RET          ;DONE
0089' C5          ..RID:  PUSH     B          ;SAVE BC-REG
008A' CD 01B3'   CALL     DATOUT  ;OUTPUT COMMAND TO FDC
008D' 3A 00C0     LDA      IODSK   ;GET DISK NUMBER
0090' CD 01B3'   CALL     DATOUT  ;OUTPUT IT TO FDC
0093' CD 0170'   CALL     WTINT   ;WAIT FOR INTERRUPT
0096' 78          MOV      A,B     ;RETURN SECTOR SIZE
0097' C1          POP      B     ;RESTORE BC-REG
0098' C9          RET          ;DONE

;
0099' ED43 00C1   ;READ:: SBCD     IOTRK   ;SAVE TRACK NUMBER
009D' ED53 00C3   SDED     IOSEC   ;SAVE SECTOR NUMBER
00A1' 22 00C5     SHLD    IODMA   ;SAVE DMA ADDRESS
00A4' 21 00C8     LXI      H,TRYCNT ;GET TRY COUNT
00A7' 360A        MVI      M,MAXTRY ;INITIALIZE TRY COUNT
00A9' CD 0152'   ..RR:   CALL     SEEK   ;SEEK TO REQUESTED TRACK
00AC' C2 0143'   JNZ      ..ERR   ;IF ERRORS, CONTINUE
00AF' AF          XRA      A
00B0' D388        OUT     DMACTL  ;RESET DMA CONTROLLER
00B2' 21 0080     LXI      H,128   ;GET SECTOR SIZE=0 SECTOR LENGTH
00B5' 3A 00CD     LDA      SECSIZ ;GET PHYSICAL SECTOR SIZE
00B8' B7          ORA      A       ;PHYSICAL SECTOR SIZE=0?
00B9' 2804        JRZ      ..NO1   ;IF SO, CONTINUE
00BB' 29          ..SL:   DAD      H       ;ELSE, SHIFT HL-REG LEFT
00BC' 3D          DCR      A       ;SECTOR SIZE TIMES
00BD' 20FC        JRNZ     ..SL
00BF' 2B          ..NO1: DCX      H       ;COUNT -1 FOR 8257
00C0' 7D          MOV      A,L     ;GET LSB OF TERMINAL COUNT
00C1' D383        OUT     CH1TC   ;OUTPUT LSB OF TERMINAL COUNT
00C3' 7C          MOV      A,H     ;GET MSB OF TERMINAL COUNT
00C4' F640        ORI      DMARD   ;ADD DMA READ COMMAND
00C6' D383        OUT     CH1TC   ;OUTPUT MSB OF TERMINAL COUNT
00C8' 2A 00C5     LHL     IODMA   ;GET DMA ADDRESS
00CB' 7D          MOV      A,L     ;GET LSB OF DMA ADDRESS

```

MPB401 - TURBODOS OPERATING SYSTEM MASTER PROCESSOR BOOT FOR IMS 401
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

00CC'   D382           OUT   CH1DMA ;OUTPUT LSB OF DMA ADDRESS
00CE'   7C            MOV   A,H   ;GET MSB OF DMA ADDRESS
00CF'   D382           OUT   CH1DMA ;OUTPUT MSB OF DMA ADDRESS
00D1'   3E42          MVI   A,CH1ENA ;GET CHANNEL 1 ENABLE COMMAND
00D3'   D388           OUT   DMACTL ;ENABLE DMA CONTROLLER
00D5'   3E86          MVI   A,FDCRD ;GET FDC READ COMMAND
00D7'   21 00D6       LXI   H,TYP COD ;GET DISK TYPE CODE
00DA'   CB5E          BIT   DDD,M   ;SINGLE DENSITY DISK?
00DC'   2802          JRZ   ..SD   ;IF SO, CONTINUE
00DE'   CBF7          SET   FDCMFM,A ;ELSE, SET FDC MFM BIT
00E0'   CD 01B3'     ..SD:  CALL  DATOUT ;OUTPUT FDC READ COMMAND
00E3'   3A 00C3       LDA   IOSEC ;GET SECTOR NUMBER
00E6'   5F            MOV   E,A   ;SECTOR NUMBER TO E-REG
00E7'   2A 00D4       LHL  XLTBL ;GET TRANSLATION TABLE ADDRESS
00EA'   7C            MOV   A,H
00EB'   B5            ORA   L     ;SECTOR TRANSLATION REQUIRED?
00EC'   2804          JRZ   ..NI   ;IF NOT, CONTINUE
00EE'   1600          MVI   D,0   ;ELSE, MAKE SECTOR DOUBLE LENGTH
00F0'   19            DAD   D     ;INDEX INTO TRANSLATION TABLE
00F1'   5E            MOV   E,M   ;GET TRANSLATED SECTOR NUMBER
00F2'   1C            ..NI:  INR   E     ;CONVERT SECTOR TO BASE 1
00F3'   3A 00CE       LDA   SECTRK ;GET NUMBER OF SECTORS/TRACK
00F6'   21 00D6       LXI   H,TYP COD ;GET DISK TYPE CODE ADDRESS
00F9'   CB56          BIT   TSD,M  ;TWO SIDED DISK?
00FB'   2802          JRZ   ..SSD  ;IF NOT, CONTINUE
00FD'   CB3F          SRLR  A     ;ELSE, CALC NUMBER OF SECTORS/SIDE
00FF'   57            ..SSD: MOV  D,A   ;SAVE NUMBER OF SECTORS/SIDE
0100'   0600          MVI   B,0   ;PRESET FOR FRONT SIDE
0102'   BB            CMP   E     ;FRONT SIDE OF DISK?
0103'   3004          JRNC  ..FS1 ;IF SO, CONTINUE
0105'   7B            MOV   A,E   ;ELSE, GET SECTOR NUMBER
0106'   92            SUB   D     ;SUBTRACT ONE SIDES WORTH
0107'   5F            MOV   E,A   ;SECTOR NUMBER TO C-REG
0108'   04            INR   B     ;SET HEAD NUMBER=1
0109'   3A 00C0       ..FS1: LDA  IODSK ;GET DISK NUMBER
010C'   04            INR   B
010D'   05            DCR   B     ;HEAD=0?
010E'   2802          JRZ   ..FS2 ;IF SO, CONTINUE
0110'   CBD7          SET   2,A   ;ELSE, SET HEAD BIT
0112'   CD 01B3'     ..FS2: CALL  DATOUT ;OUTPUT UNIT NUMBER
0115'   3A 00C1       LDA   IOTRK ;GET TRACK NUMBER
0118'   CD 01B3'     CALL  DATOUT ;OUTPUT TRACK NUMBER
011B'   78            MOV   A,B   ;GET HEAD NUMBER
011C'   CD 01B3'     CALL  DATOUT ;OUTPUT HEAD NUMBER
011F'   7B            MOV   A,E   ;GET SECTOR NUMBER
0120'   CD 01B3'     CALL  DATOUT ;OUTPUT SECTOR NUMBER
0123'   3A 00CD       LDA   SECSIZ ;GET SECTOR SIZE
0126'   F5            PUSH  PSW   ;SAVE SECTOR SIZE
0127'   CD 01B3'     CALL  DATOUT ;OUTPUT SECTOR SIZE
012A'   7A            MOV   A,D   ;GET EOT
012B'   CD 01B3'     CALL  DATOUT ;OUTPUT EOT
012E'   3A 00D7       LDA   GAPLEN ;GET GAP LENGTH
0131'   CD 01B3'     CALL  DATOUT ;OUTPUT GAP LENGTH
0134'   F1            POP   PSW   ;RESTORE SECTOR SIZE

```

MPB401 - TURBODOS OPERATING SYSTEM MASTER PROCESSOR BOOT FOR IMS 401
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

0135' B7          ORA      A          ;SECTOR SIZE=0?
0136' 3E80       MVI      A,128     ;PRESET DTL=128
0138' 2802       JRZ      ..NO      ;IF SECTOR SIZE=0, CONTINUE
013A' 3EFF       MVI      A,OFFH    ;ELSE, DTL=OFFH
013C' CD 01B3'   ..NO:  CALL     DATOUT   ;OUTPUT DTL
013F' CD 0170'   CALL     WTINT   ;WAIT FOR INTERRUPT
0142' C8         RZ         ;IF NO ERRORS, DONE
0143' CD 0165'   ..ERR: CALL     RECAL   ;RECALIBRATE DRIVE
0146' 2007       JRNZ     ..X       ;IF ERRORS, CONTINUE
0148' 21 00C8   LXI      H,TRYCNT ;ELSE, GET TRY COUNT
014B' 35         DCR      M         ;DECREMENT TRY COUNT
014C' C2 00A9'   JNZ      ..RR      ;IF COUNT NOT EXH, TRY AGAIN
014F' 3EFF       ..X:  MVI      A,OFFH  ;ELSE, SET RETURN CODE=OFFH
0151' C9         RET         ;DONE

;
0152' 3E0F       ;SEEK: MVI      A,FDCSK   ;SET FDC SEEK COMMAND
0154' CD 01B3'   CALL     DATOUT   ;OUTPUT FDC SEEK COMMAND
0157' 3A 00C0   LDA      IODSK    ;GET DISK NUMBER
015A' CD 01B3'   CALL     DATOUT   ;OUTPUT DISK NUMBER
015D' 3A 00C1   LDA      IOTRK    ;GET TRACK NUMBER
0160' CD 01B3'   CALL     DATOUT   ;OUTPUT TRACK NUMBER
0163' 180B       JMPR     WTINT    ;WAIT FOR INTERRUPT

;
0165' 3E07       ;RECAL: MVI      A,FDCRCL  ;SET FDC RECALIBRATE COMMAND
0167' CD 01B3'   CALL     DATOUT   ;OUTPUT FDC RECALIBRATE COMMAND
016A' 3A 00C0   LDA      IODSK    ;GET DISK NUMBER
016D' CD 01B3'   CALL     DATOUT   ;OUTPUT DISK NUMBER

;
0170' DB8C       ;WTINT: IN       DSKCTL   ;GET DISK CONTROLLER STATUS
0172' 0F         RRC         ;TEST FOR FDC INTERRUPT
0173' 30FB       JRNC     WTINT    ;IF NO INTERRUPT, WAIT
0175' DB8E       ..RQML: IN       FDCST   ;GET FDC STATUS
0177' 07         RLC         ;FDC READY TO COMMUNICATE?
0178' 30FB       JRNC     ..RQML  ;IF NOT, WAIT
017A' 07         RLC         ;TEST FDC DIRECTION
017B' 3818       JRC      ..RW     ;IF FDC OUTPUT AVAILABLE, PROCESS
017D' 3E08       MVI      A,FDCSIS  ;GET SENSE INTERRUPT STATUS CMD
017F' D38F       OUT      FDCDAT   ;OUTPUT BYTE TO FDC DATA REGISTER
0181' CD 01A7'   CALL     DATAIN  ;GET STATUS REGISTER 0
0184' 4F         MOV      C,A       ;SAVE IT IN C-REG
0185' E6C0       ANI      0COH    ;EXTRACT COMPLETION STATUS
0187' FE80       CPI      80H    ;INTERRUPT STACK EMPTY?
0189' 2818       JRZ      ..X       ;IF SO, DONE
018B' CD 01A7'   CALL     DATAIN  ;GET PRESENT CYLINDER NUMBER
018E' CB69       BIT      STOSE,C  ;READY LINE CHANGE STATE?
0190' 28E3       JRZ      ..RQML  ;IF SO, IGNORE
0192' 51         MOV      D,C       ;GET STATUS REGISTER 0 IN D-REG
0193' 18E0       JMPR     ..RQML  ;FLUSH ANY REMAINING INTERRUPTS
0195' CD 01A7'   ..RW:  CALL     DATAIN  ;GET STATUS REGISTER 0
0198' 57         MOV      D,A       ;TO D-REG
0199' 0606       MVI      B,6       ;B=LENGTH OF REMAINING RESULT PHAS
019B' CD 01A7'   ..RL:  CALL     DATAIN  ;GET RESULT BYTE FROM FDC
019E' 10FB       DJNZ     ..RL     ;READ ALL SEVEN BYTES
01A0' 47         MOV      B,A       ;SAVE SECTOR SIZE IN B-REG

```

MPB401 - TURBODOS OPERATING SYSTEM MASTER PROCESSOR BOOT FOR IMS 401
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

01A1' 18D2          JMPR    ..RQML ;FLUSH ANY REMAINING INTERRUPTS
01A3' 7A           ..X:  MOV    A,D  ;GET STATUS REGISTER 0
01A4' E6C0        ANI    OCOH  ;EXTRACT COMPLETION STATUS
01A6' C9          RET      ;DONE

;
01A7' DB8E        ;DATAIN: IN    FDCST  ;GET FDC STATUS
01A9' 07          RLC      ;TEST FDC FOR READY
01AA' 30FB        JRNC   DATAIN ;IF NOT READY, WAIT
01AC' 07          RLC      ;TEST FDC DIRECTION
01AD' D2 0000:06 JNC    .BEG.# ;IF WRONG DIRECTION, CONTINUE
01B0' DB8F        IN      FDCDAT ;GET FDC DATA BYTE
01B2' C9          RET      ;DONE

;
01B3' 4F          ;DATOUT: MOV   C,A  ;SAVE OUTPUT BYTE
01B4' DB8E        ..RW:  IN    FDCST  ;GET FDC STATUS
01B6' 07          RLC      ;TEST FDC FOR READY
01B7' 30FB        JRNC   ..RW      ;IF NOT READY, WAIT
01B9' 07          RLC      ;TEST FDC DIRECTION
01BA' DA 0000:06 JC     .BEG.# ;IF WRONG DIRECTION, CONTINUE
01BD' 79          MOV    A,C  ;RESTORE OUTPUT BUTE
01BE' D38F        OUT    FDCDAT ;OUTPUT BYTE TO FDC DATA REGISTER
01C0' C9          RET      ;DONE

;
01C1' AF          ;XFER:: XRA   A      ;MAKE DEFAULT BUFFER EMPTY
01C2' 32 0080     STA   TBUF  ;TRANSFER TO O/S LOADER
01C5' C3 0100     JMP   TPA

;
.END

```

SPB740 - TURBODOS OPERATING SYSTEM SLAVE PROCESSOR BOOTSTRAP (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

; *****
; *
; * This is a boot ROM for the IMS 740 slave processor *
; * board. It downloads and executes a block of code *
; * sent by the master. Normally, the master sends *
; * the network loader module LOD740, which handles *
; * the actual downloading of the slave operating sys- *
; * tem. *
; *****
;
; COPYRIGHT (C) 1982, SOFTWARE 2000, INC.
;
; AUTHORS: RONALD E. RAIKES
;          MICHAEL D. BUSCH
;
; VERSION: EXAMPLE
;
; IDENT SPB740 ;MODULE ID
;
; INSERT DREQUATE ;DRIVER SYMBOLIC EQUIVALENCES
;
0020 PORTAD = 20H ;8255 PORT A DATA REGISTER
0024 PIOADR = 24H ;PIO PORT A DATA REGISTER
0025 PIOBDR = 25H ;PIO PORT B DATA REGISTER
0026 PIOACR = 26H ;PIO PORT A CONTROL REGISTER
0027 PIOBCR = 27H ;PIO PORT B CONTROL REGISTER
;
0005 PORTC5 = 5 ;PORT C DATA BIT 5 (IBF)
0006 PORTC7 = 6 ;PORT C DATA BIT 7 (OBF)
;
0000' .LOC .PROG.# ;LOCATE IN PROGRAM AREA
;
0000' F3 SPBOOT: DI ;DISABLE INTERRUPTS
0001' 31 0900 LXI SP,900H ;INITIALIZE STACK POINTER
0004' 3ECF MVI A,OCFH ;GET PIO A MODE WORD (MODE 3)
0006' D326 OUT PIOACR ;OUTPUT PIO A MODE WORD
0008' 3EFF MVI A,OFFH ;GET PIO A MODE 3 MODE WORD
000A' D326 OUT PIOACR ;OUTPUT PIO A MODE 3 MODE WORD
000C' 3EFO MVI A,OF0H ;GET PIO B DATA DATA WORD
000E' D325 OUT PIOBDR ;OUTPUT PIO B DATA WORD
0010' 3E0F MVI A,OFH ;GET PIO B MODE WORD (MODE 0)
0012' D327 OUT PIOBCR ;OUTPUT PIO B MODE WORD
0014' DB20 IN PORTAD ;CLEAR INPUT PORT A
0016' 21 0900 LXI H,0900H ;GET INTERMEDIATE BOOT LOAD ADDRESS
0019' 11 0004 LXI D,4 ;GET LENGTH OF LOAD ADDRESS/LENGTH
001C' CD 003B' CALL RCV740 ;RECEIVE LOAD ADDRESS/LENGTH
001F' 2A 0900 LHL D,0900H ;GET LOAD ADDRESS
0022' ED5B 0902 LDED 0902H ;GET LENGTH
0026' E5 PUSH H ;SAVE LOAD ADDRESS
0027' CD 003B' CALL RCV740 ;RECEIVE INTERMEDIATE BOOT LOADER
002A' E5 PUSH H ;PUSH TRANSFER CODE ADDR ONTO STAC
002B' EB XCHG ;TRANSFER CODE ADDRESS TO DE-REG

```

SPB740 - TURBODOS OPERATING SYSTEM SLAVE PROCESSOR BOOTSTRAP (IMS 740)
 COPYRIGHT (C) 1982, SOFTWARE 2000, INC.

```

002C' 21 0035'      LXI    H,XFRCOD  ;GET TRANSFER CODE
002F' 01 0006'      LXI    B,XFRLen  ;GET TRANSFER CODE LENGTH
0032' EDB0          LDIR                   ;MOVE TRANSFER CODE TO DMA ADDRESS
0034' C9            RET                      ;TRANSFER TO TRANSFER CODE

;
0035' F3            XFRCOD: DI              ;DISABLE INTERRUPTS
0036' 3E0           MVI    A,OBOH         ;GET PIO B DATA BYTE
0038' D325          OUT    PIOBDR        ;DIABLE BOOTSTRAP EPROM
003A' C9            RET                      ;DONE

;
0006              XFRLen = .-XFRCOD      ;TRANSFER CODE LENGTH
;
003B' CD 0046'      RCV740: CALL   INBYT    ;INPUT BYTE
003E' 77            MOV    M,A          ;SAVE BYTE IN MESSAGE
003F' 23            INX    H
0040' 1B            DCX    D            ;DECREMENT COUNT
0041' 7A            MOV    A,D
0042' B3            ORA    E            ;COUNT=0?
0043' 20F6          JRNZ   RCV740       ;IF NOT, CONTINUE
0045' C9            RET                      ;ELSE, DONE

;
0046' DB24          INBYT: IN    PIOADR   ;GET PIO A DATA REGISTER
0048' CB77          BIT    PORTC7,A    ;PORT C BIT 7 SET? (OBF)
004A' 20FA          JRNZ   INBYT      ;IF NOT, WAIT
004C' DB20          IN    PORTAD   ;INPUT BYTE FROM PORT A
004E' C9            RET                      ;DONE

;
0000'              .END    SPBOOT

```