```
L           JJJ      SSSS
L            J      S    S
L            J      S
L            J       SSS
L            J          S
L   L    J   J      S    S
LLLLL     JJJ       SSSS
```

Sat 15-Feb-1986 16:59:07

Print request number 809

Station: $36

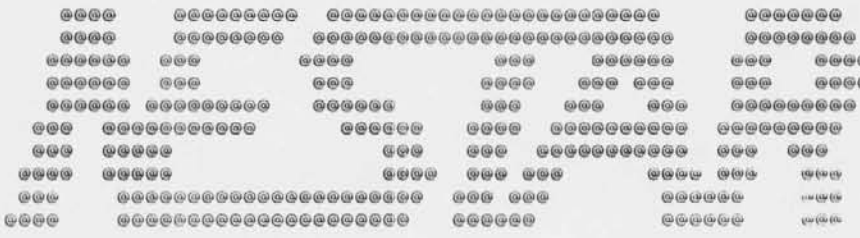
Name: L J Shustek

File Server: BUTLER ($FE)

NFS Pathname:

Filename (s):

Print Server: LENNON ($8A)
Printer: LASER
Setup: LANDSCAPE
Priority: Standard
Copies: 1
Eject: 0



- Don't truncate names when printed in window (on at least 16 or 68)

```
                page    58,132
                title   TALK - Multiple station conversation program

;--------------------------------------------------------------------------
;
;
;   TALK        Multiple station conversation program
;
;
;       This is a background exit-and-stay-resident program which allows
;       multiple stations to engage in a simultaneous conversation.
;
;       Screen display is within four windows:  one for the typing buffer,
;       one for the display script of messages from all stations, one
;       for a list of known stations, and one for a list of known groups.
;
;       The destination of messages typed is shown by highlighting the
;       group name and/or station names in the appropriate windows.
;       The cursor arrow keys are used to change the destination.
;
;       The windows can be displayed by a keyboard trigger character and,
;       if desired, automatically when a message is received.  If the
;       automatic window popup is not chosen, any messages received are
;       put in the hidden window until displayed.
;
;
;       For build information about talk, see the file talkh.asm.
;
;
;                   (C) Copyright 1984, Nestar Systems Inc.
;
;--------------------------------------------------------------------------------
;
; Change log
;
;  When    Vers      Who           What changed
; ------- ----  ------------    ------------------
; 7/11/84        L. Shustek      Experiments.
; 7/19/84        L. Shustek      Initial internal release.
; 7/25/84        L. Shustek      Restructure into exit-and-stay-resident program.
;
; 8/ 2/84 0.32   L. Shustek      Add stn flags and better station removal logic.
;
; 8/ 7/84 0.34   L. Shustek      Change timer interrupt hook to use hw int instead
;                                  of dos user exit.  Add bold stn names.
;
; 8/23/84 0.35   L. Shustek      Higher pitch for new-station tweedle.
;                                Implement "int kb" function 99 to return status.
;                                Allow trigger character to close window.
;                                Add name and version to window border.
;                                Use short L2 timeouts only while sending msgs.
;                                Do open_recv only every few ticks, for lower overhead.
;                                Allow task activation during kb_int, so it can
```

```
;                                       be useful during NWCMDS, etc.
;                                   Filter out bells and linefeeds from messages.
;
; 8/28/84 0.40  L. Shustek          Major changes for addition of groups in the 4th
;                                   window, and selected destinations.
;
; 8/31/84 0.41  L. Shustek          Do acknow during rcv for multi-packet connects.
;                                   Remember unused groups.  Remember previous grp/stn
;                                   destination.  Use newer stn name, if any.  Don't
;                                   echo in display window if send-to-1-stn fails.
;                                   Don't show rumors.  Low beep if send failure.
;                                   Minimize group/stn window glitches by overwriting
;                                   instead of clearing and rewriting when possible.
;                                   Implement F1/F3 functions to copy previous text.
;                                   Add kb_int function call to send a message
;                                   from a program.
;
; 9/06/84 0.42  L. Shustek          Check for unused groups more often.
;                                   Fix task conflicts in updating data structures.
;                                   Add internal error detection.
;                                   Put back rumored station display, but
;                                   send silent probe messages to verify rumors.
;                                   Break up into multiple assemblies, fighting
;                                   with the linker to order things properly.
;
; 9/18/84 0.43  L. Shustek          Use new window package to provide a second
;                                   page, and do PGUP, PGDN, HOME, END keys.
;                                   Underline stations being sent to.
;                                   Check user/group names for length & bad chars.
;                                   Make tasks start up more cleanly after install.
;                                   Allow recursive timer interrupts for tweedles.
;
; 9/21/84 0.44  L.Shustek           Don't acknowledge (l4_acknow) broadcast msgs.
;                                   Don't probe rumors if fileserver connection is
;                                   in progress;  just get out as quickly as possible.
;
; 9/21/84 0.45  L. Shustek          Fix rare <iu> err caused by check_incoming not
;                                   looking at L4_busy if open_recv was already true.
;
; 2/22/85 0.46  L. Shustek          Fix RB chain end test in busy_rb_check
;                                   for compatibility with L4 roms after v1.1.
;
; 6/19/85 0.47  L. Shustek          Add int16h function codes to suspend and resume
;                                   interrupt processing.  For coexistence with CARDCHK.
;                                   Change "Group:" to "Groups:"; add "Users:".
;
; 2/14/86 0.48  L. Shustek          Expand user window to 3 lines; widen all windows.
;                                   Don't do broadcast until all system RBs are quiescent;
;                                     fixes occasional 30 second delay at installation due
;                                     to fileserver bug: broadcast causes the current
;                                     connection to be aborted!
;                                   Print install message before setting interrupt vectors.
;                                   Don't open the windows if screen is in graphic mode.
;                                   Add TIMESTAMP keyword to enable msg timestamps.
```

```
;                                       Add POPDOWN mode to auto-popdown window after n seconds.
;                                       Add CHANNEL to specify separate TALK channels.
;                                       Allow color attribute modifier for better colors.
;                                       Do an END operation when the window is opened.
;                                       Change number of display pages from 2 to 3.
;                                       Allow user window to be specified at invocation.
;
;-------------------------------------------------------------------------------
;
;  Yet to do (or think about):
;
;       Allow a way to turn it off, or at least stop the bells.
;       User-exit to supplied procedure for certain received message types.
;       Ask for name if no USER= environment string is found?
;       "TALK ?" should give help info from init phase
;       Instead of "already installed", parse command line and
;          reset options;  show new options.
;       Wait for retrace on graphics screens?  (Slow!)  (Actually is a
;          feature request for the WINDOW package, not TALK.)
;       Bug: stn $FF should be ok, but we use it for a "broadcast" flag in
;         the sendmsg routine.
;       Add the remaining DOS editing key functions.
;       Add a priority message type, or a "super popup" mode for important
;          messages.
;       TALK ON and TALK OFF commands?  (Why?)
;       Adjust the user (and group?) window dynamically depending on the
;          number of users.
;       Bug: Nulls are getting into the group list somehow.
;
;-------------------------------------------------------------------------------


;-------------------------------------------------------------------------------
;
;
;               A short course on the internal design of TALK
;
;
; 1. Gereral Structure
;
;
; TALK consists of a resident part, which becomes part of DOS using the
; exit-and-stay-resident function call, and a transient part which is used
; for initialization.  The resident part contains interrupt routines, a
; task dispatcher, and 4 tasks for processing concurrent operations.
; The static structure looks roughly as follows:
;
;       TALK data area
;       Main Tasks
;           Keyboard Task
;           Receive Task
;           Transmit Task
;       List and Utility routines
;       Dispatcher
```

```
;       Interrupt routines
;           Interrupt Task
;           Keyboard interrupt (int 16h) routine
;           L4 Exit interrupt routine
;           Timer interrupt routine
;       Shutdown procedure
;       Initialization
;           Command parsing
;           Window initialization
;           Network initialization
;           Evironment string parsing
;           Interrupt routine installation
;           Exit-and-stay-resident
;
;
; 2. Task dispatching
;
;
; The dispatcher is a round-robin non-preemptive scheduler which just
; saves and restores registers on a stack for each task.  All task code is
; required to include a "call dispatch" in every loop which takes an
; indeterminate amount of time.
;
; The task dispatcher is started from the Interrupt Task, which is in turn
; called from one of the interrupt routines when a message must be processed
; in either background or foreground.  The only difference between background
; and foreground is whether the windows are displayed, and that is controlled
; by the Keyboard Task on the basis of flags set by the interrupt routines.
; Once started, the tasks will run until the windows are closed and no messages
; are in progress;  state flags are set by the various tasks which are used
; by the Interrupt Task to indicate when it should return to its interrupt
; routine and thus suspend the task dispatcher until the next time a signficant
; event has occurred.
;
;
; 3. Message formats
;
;
; TALK uses only one well-known socket.  Within that socket, three message
; types are used, for:
;
;       genl_msg_type:    General messages between stations
;       logon_msg_type:   Logon broadcast messages
;       logoff_msg_type:  Logoff messages (not currently sent)
;
; Within each message, regardless of type, may be several submessages.
; Each submessage starts with a 1-byte code and a variable-length data part.
; The submessages are:
;
;       grp_subtype:  the complete group namelist known by the sender.
;       stn_subtype:  the complete station namelist known by the sender.
;       txt_subtype:  a text message to be displayed, terminated with CR.
;
; Currently all three submessages are included as part of ANY messages sent
```

```
; between stations, except that the Logon broadcast message does not have
; any txt_subtype.
;
; When a station first installs TALK, a broadcast message is sent.  All
; stations which hear the broadcast send a message containing group and
; station lists, from which the receiving station constructs its initial
; lists.  From then on, every message sent or received contains group and
; station lists along with the text.
;
; Group information is always taken verbatim.  Station information which is
; secondhand is treated as a "rumor", which is to say that the existence of
; a station is not confirmed until a message is received from or successfully
; sent to that station.  A station is removed from the station list whenever
; a direct send to it fails.  (All transmissions are retried "retries" times.)
; Rumored stations may or may not be displayed, depending on the setting of the
; assembly switch "show_rumors".
;
;
; 4. Task interaction
;
;
; As in all multitasking systems, care must be taken when accessing shared
; data structures.  The dispatcher in TALK has the property that tasks are
; switched only when an explicit call to DISPATCH is made, so critical sections
; that update shared data need not generally lock access to the data.
;
; The real danger comes in forgetting which procedures call DISPATCH.  In
; particular, you must always remember that sending or receiving messages
; does so, and that when other tasks get control, data like the station lists
; and group lists may change.  For example, the send task walks down the
; station-list to send messages to each station, and so the receive task
; must not delete any station-list records if the send task is busy.
;
; The following is a list of places where the tasks do a DISPATCH.  Please keep
; this list up-to-date so that shared data access can be monitored:
;
; keyboard_task:- Wait for other tasks to idle before shutdown
;               - Shutdown (the DISPATCH call which stops the dispatcher)
;               - Wait for keyboard character
;               - Wait for send_task to release keyboard buffer
;
; receive_task: - Wait for send_task to do a broadcast
;               - Receive message
;
; send_task:    - Wait for work to do (any of 4 or so conditions)
;               - Send a message
;
;
;
;...more words to come, as I have the patience...
;
;-------------------------------------------------------------------------------
;-------------------------------------------------------------------------------
```

```
                                .sall           ;suppress macro expansions

                                subttl  ...Permanently resident code...

                        ;;      include m:struct.mac            ;structure macros (not listed)
                                .list

                        C       include talkv.asm               ;symbols and variables
                        C
                        C       ;---------------------------------------------------------------------------
                        C       ;
                        C       ;  talkv.asm    TALK symbols and variables
                        C       ;
                        C       ;---------------------------------------------------------------------------
                        C
                        C       version         macro
                        C                       db      '0.48'                  ;version number
                        C                       endm
                        C
= 0D04                  C       talk_wks        equ     0d04h ;+channel!;well-known socket base.  Change it
                        C                                                       ;whenver packet format changes'
                        C
                        C                       .lfcond
= FFFF                  C       c_true          equ     0ffffh
= 0000                  C       c_false         equ     0000h
                        C
=                       C       show_rumors     equ     c_true                  ;show rumored stns in stn_list?
=                       C       assert          equ     c_true                  ;generate internal error checking?
                        C
                        C
                        C                       extrn   window:near
                        C
                        C       cgrp            group   hseg,vseg,cseg
                        C
0000                    C       hseg            segment common 'hsegcl' ;dummy (this assembler'll kill me yet)
0000                    C       hseg            ends
                        C
0000                    C       vseg            segment common 'vsegcl'
                        C
                        C       ;
                        C       ;               LEVEL 4 SYMBOLS
                        C       ;
                        C
= 0000                  C       on_nic          equ     0
= 0000                  C       l4_in_our_seg   equ     0
                        C
                        C       ;;              include e:l4asm.itf             ;level 4 interface
                        C                       .list
                        C
                        C
                        C       ;
                        C       ;               SYMBOLS
                        C       ;
```

```
                        level_four_interface

                        C
= 0004                  C  ntasks          equ     4                    ;number of tasks
= 0258                  C  max_stn_list    equ     600                  ;max size of station list
= 00C8                  C  max_grp_list    equ     200                  ;max size of group list
= 0010                  C  max_groups      equ     16                   ;max number of groups (<=16)
= 0010                  C  max_namesize    equ     16                   ;largest name allowed
                        C                                               ; (for internal debug only)
= 0003                  C  n_pages         equ     3                    ;number of display pages
                        C
= 0003                  C  how_often       equ     3                    ;3 x 55 = 165 msec check for msgs
= 0006                  C  timeout         equ     6                    ;6 x 55 = 330 msec timeouts
= 0002                  C  retries         equ     2                    ;number of retries
                        C
= 0097                  C  logoff_msg_type equ     97h                  ;logoff message type
= 0098                  C  logon_msg_type  equ     98h                  ;logon message
= 0099                  C  genl_msg_type   equ     99h                  ;talk general message type
= 0096                  C  rqscrn_msg_type equ     96h                  ;requestscreen message type
= 0095                  C  scrn_msg_type   equ     95h                  ;screen message type
= 0094                  C  kbchar_msg_type equ     94h                  ;kb char message type
                        C
= 00AA                  C  stn_subtype     equ     0aah                 ;subtype for station recs
= 00BB                  C  grp_subtype     equ     0bbh                 ;subtype for groups recs
= 00CC                  C  txt_subtype     equ     0cch                 ;subtype for text
                        C
                        C
= 0016                  C  key_int         equ     16h                  ;rom bios keyboard int
= 0000                  C  key_read        equ     0                    ;read key function
= 0001                  C  key_stat        equ     1                    ;key status function
= 0002                  C  key_shift       equ     2                    ;key shift status func.
= 0063                  C  key_talk        equ     99                   ;nestar extended info for talk
= 0062                  C  key_nwcmds      equ     98                   ;nestar extended info for nwcmds
= 0061                  C  key_talk_send   equ     97                   ;nestar extended cmd for send_msg
= 0060                  C  key_talk_stop   equ     96                   ;nestar extended cmd for "suspend TALK"
= 005F                  C  key_talk_start  equ     95                   ;nestar extended cmd for "resume TALK"
                        C
                        C  ; Nestar extended int 16h functions return AH negated to indicate that they
                        C  ; did something;  if the program (eg TALK) is not installed then the rom bios
                        C  ; will return with AH unchanged.
                        C  ;
                        C  ; The extended-info call (key_talk, key_nwcmds, etc.) returns the following
                        C  ; flags in AL, or'd by all copies of the program:
                        C
= 0001                  C  key_ext_active  equ     01                   ;extended info flag: active
= 0002                  C  key_ext_idle    equ     02                   ;extended info flag: idle
                        C
                        C
= 0011                  C  equip_int       equ     11h                  ;equipment determination int
                        C
= 001A                  C  timer_int       equ     1ah                  ;rom bios timer int
= 0000                  C  timer_read      equ     0                    ;read timer into cx:dx
                        C
= 0010                  C  video_int       equ     10h                  ;rom bios video int
= 0002                  C  video_setcursor equ     2                    ;set cursor from dx
= 0003                  C  video_getcursor equ     3                    ;get cursor in dx
```

```
                        level_four_interface

= 0006                  C  video_scroll     equ     6               ;scroll or clear screen
= 000A                  C  video_write_ch   equ     10              ;write single character
= 000E                  C  video_write_tty  equ     14              ;write tty function
                        C
                        C
= 0021                  C  dos_int          equ     21h             ;dos function call interrupt
                        C
= 0002                  C  dosint_printc    equ     02h             ;print character in dl
= 0009                  C  dosint_prints    equ     09h             ;print string at ds:dx until '$'
= 0031                  C  dosint_exitstay  equ     31h             ;exit but stay resident
= 004C                  C  dosint_exit      equ     4ch             ;exit program normally
                        C
= 002C                  C  psp_environ      equ     2ch             ;offset of env segment in psp
                        C
                        C
= 0008                  C  timer_tick       equ     08h             ;timer tick hardware interrupt
= 0043                  C  timer_ctrl       equ     043h            ;timer (8253) control register
= 00A6                  C  timer_ctrl_msb   equ     0a6h            ;  load msb of counter 2
                        C
= 0042                  C  timer_ch2        equ     042h            ;timer (8253) channel 2 data
= 0061                  C  kb_ctrl          equ     061h            ;keyboard (8255) control: 02h is spkr
= 0003                  C  kb_ctrl_spkr     equ     003h            ;   speaker enable bits
                        C
                        C
= 0007                  C  bell             equ     07h             ;bell
= 0008                  C  bs               equ     08h             ;backspace
= 000A                  C  lf               equ     0ah             ;linefeed
= 000D                  C  cr               equ     0dh             ;carriage return
= 001B                  C  esc              equ     1bh             ;escape
                        C
= 4800                  C  key_up           equ     4800h           ;keyboard arrow keys
= 5000                  C  key_down         equ     5000h
= 4B00                  C  key_left         equ     4b00h
= 4D00                  C  key_right        equ     4d00h
                        C
= 3B00                  C  key_f1           equ     3b00h           ;keyboard F1 key
= 3D00                  C  key_f3           equ     3d00h           ;keyboard F3 key
                        C
= 5200                  C  key_ins          equ     5200h           ;keyboard INS key
= 5300                  C  key_del          equ     5300h           ;keyboard DEL key
                        C
= 4700                  C  key_home         equ     4700h           ;keyboard home key
= 4900                  C  key_pgup         equ     4900h           ;keyboard pageup key
= 4F00                  C  key_end          equ     4f00h           ;keyboard end key
= 5100                  C  key_pgdn         equ     5100h           ;keyboard pagedown key
                        C
                        C
= 0000                  C  window_define    equ     0               ;window define
= 0001                  C  window_open      equ     1               ;window open
= 0002                  C  window_close     equ     2               ;window close
= 0003                  C  window_print     equ     3               ;window print character
= 0004                  C  window_getcurs   equ     4               ;window get cursor
= 0005                  C  window_setcurs   equ     5               ;window set cursor
= 0006                  C  window_select    equ     6               ;window select
```

```
                        level_four_interface

= 0007                  C  window_init     equ     7                       ;window initialization
= 0008                  C  window_setattr  equ     8                       ;window set char attribute
= 0009                  C  window_pageop   equ     9                       ;window page operations
                        C
= 0601                  C  select_dwin     equ     window_select*256+1     ;select display window
= 0602                  C  select_twin     equ     window_select*256+2     ;select typing window
= 0603                  C  select_swin     equ     window_select*256+3     ;select station window
= 0604                  C  select_gwin     equ     window_select*256+4     ;select group window
                        C
                        C
                        C  ;
                        C  ;               LOCAL STORAGE
                        C  ;
                        C
0000  03 14 15 54 41 4C C                  db      3h,14h,15h,'TALK'       ;debug marker (pi)
      4B                C
                        C
                        C
                        C  ;       Tasks
                        C
                        C
= 0002                  C  tcbsize         equ     2                       ;size of tcb
0007                    C  tcbs            label   word                    ;task control blocks (TCB)
0007  0F00 R            C  task0           dw      offset cgrp:stack0
0009  1158 R            C  task1           dw      offset cgrp:stack1
000B  13B0 R            C  task2           dw      offset cgrp:stack2
000D  1608 R            C  task3           dw      offset cgrp:stack3
                        C
000F  0000              C  curtask         dw      0                       ;current TCB offset
                        C
0011  ????              C  savss           dw      ?                       ;keyboard int stack
0013  ????              C  savsp           dw      ?
                        C
                        C
                        C  ;       State flags.    1 is affirmative, 0 is negative.
                        C
                        C
0015  53 54 41 54 45 53 C                  db      'STATES'                ;debug marker
001B  00                C  tasks_active    db      0                       ;task dispatcher active
001C  00                C  send_busy       db      0                       ;send task is busy
001D  00                C  recv_busy       db      0                       ;receive task is busy
001E  00                C  timer_int_busy  db      0                       ;timer interrupt is busy
001F  00                C  14_exit_busy    db      0                       ;14 exit routine is busy
0020  00                C  kb_int_busy     db      0                       ;keyboard interrupt is busy
0021  00                C  other_conn_busy db      0                       ;another (fs?) connection is busy
0022  00                C  windows_open    db      0                       ;windows are open
0023  00                C  do_open         db      0                       ;request to open windows
0024  00                C  do_stop         db      0                       ;request to stop all tasks
0025  00                C  first_dispatch  db      0                       ;request dispatch to initialize
0026  00                C  open_recvd      db      0                       ;14_openrcv returned TRUE
0027  00                C  send_msg_rqst   db      0                       ;send-msg request from kb_int
0028  00                C  suspended       db      0                       ;suspended by int16h special fct
0029  00                C  popped_up       db      0                       ;windows auto-popped up
```

```
                        level_four_interface

                        C
                        C
                        C  ;       Options
                        C
                        C
002A  00                C  test_mode       db      0 ;boolean              ;test mode is on
002B  00                C  auto_popup      db      0 ;boolean              ;windows popup automatically?
002C  00                C  timestamp       db      0 ;boolean              ;timestamp messages?
002D  00                C  auto_popdown    db      0 ;boolean              ;windows popdown automatically?
002E  010E              C  popdown_time    dw      15*18 ;(seconds*ticks)  ;auto popdown time
0030  00                C  channel         db      0                       ;channel (added to wks!)
                        C
0031  00                C  color           db      0                       ;color attribute modifier
0032  07                C  char_normal     db      07h                     ;normal character attribute
0033  0F                C  char_bold       db      0fh                     ;bold (highlighted) character
0034  01                C  char_line       db      01h                     ;underlined character
0035  09                C  char_boldline   db      09h                     ;bold underlined character
                        C
                        C
                        C  ;       Windows
                        C
                        C
                        C  ; (If you change these window sizes, check the window buffers as well!)
                        C  ; (You might also want to check the keyboard buffer size.)
                        C
0036  57 49 4E 44 4F 57  C                  db      'WINDOWS'               ;debug marker
      53                C
003D                    C  gwin_upperleft  label   word                    ;upper left corner of group window
003D  05                C  gwin_left_col   db      5
003E  00                C  gwin_top_row    db      0
003F                    C  gwin_lowerright label   word                    ;lower right corner of group window
003F  4E                C  gwin_right_col  db      78
0040  02                C  gwin_bottom_row db      2
                        C
0041                    C  swin_upperleft  label   word                    ;upper left corner of station window
0041  05                C  swin_left_col   db      5
0042  02                C  swin_top_row    db      2
0043                    C  swin_lowerright label   word                    ;lower right corner of station window
0043  4E                C  swin_right_col  db      78
0044  06                C  swin_bottom_row db      6
                        C
0045                    C  dwin_upperleft  label   word                    ;upper left corner of display window
0045  05                C  dwin_left_col   db      5
0046  06                C  dwin_top_row    db      6
0047                    C  dwin_lowerright label   word                    ;lower right corner of display window
0047  4E                C  dwin_right_col  db      78
0048  14                C  dwin_bottom_row db      20
                        C
0049                    C  twin_upperleft  label   word                    ;upper left corner of typing window
0049  05                C  twin_left_col   db      5
004A  14                C  twin_top_row    db      20
004B                    C  twin_lowerright label   word                    ;lower right corner of typing window
004B  4E                C  twin_right_col  db      78
004C  17                C  twin_bottom_row db      23
```

```
                                C
                                C
                                C  ;       Buffers
                                C
                                C
004D  42 55 46 46 45 52         C                  db      'BUFFERS'               ;debug marker
      53                        C
0054  00                        C  kbd_buffer_full db      0                       ;1 if buffer is full
0055  00 18                     C  kb_cursor       db      0,24                    ;keyboard cursor
                                C
0057  ????????                 C  send_msg_ptr    dd      ?                       ;ptr to kb_int send_msg buffer
005B  ??                        C  send_msg_stn    db      ?                       ;stn to send msg to
005C  ??                        C  send_msg_stat   db      ?                       ;status of kb_int send_msg
                                C
005D  14                        C  keychar         db      14h                     ;trigger is ctrl-t default
005E  00                        C  keychar_scan    db      0                       ;scan code if above is zero
                                C
                                C
= 008F                          C  kbd_bufsize     equ     2*(78-5-1)-1                    ;keyboard buffer size
= 0014                          C  from_to_size    equ     20                      ;max size of "from->to":
= 03C3                          C  rcv_bufsize     equ     kbd_bufsize+max_stn_list+max_grp_list+from_to_size
= 03C3                          C  snd_bufsize     equ     kbd_bufsize+max_stn_list+max_grp_list+from_to_size
                                C
005F      8F [                  C  kbd_buffer      db      kbd_bufsize dup(?)      ;keyboard buffer
                ??              C
                    ]           C
                                C
00EE      8F [                  C  kbd_buffer_prev db      kbd_bufsize dup(?)      ;previous keyboard buffer
                ??              C
                    ]           C
                                C
017D  03C3 [                    C  rcv_buffer      db      rcv_bufsize dup(?)      ;receive message buffer
                ??              C
                    ]           C
                                C
0540  03C3 [                    C  snd_buffer      db      snd_bufsize dup(?)      ;send message buffer
                ??              C
                    ]           C
                                C
                                C
0903  0000                      C  kbd_prevbufsiz  dw      0                       ;size of previous kbd line
0905  0000                      C  kbd_prevbufptr  dw      0                       ;offset into previous kbd line
0907  00                        C  kbd_prev_ins    db      0                       ;insert mode w/rt previous kbd line
                                C
0908  ????                      C  snd_buffer_size dw      ?                       ;size of message in snd_buffer
090A  ????                      C  snd_buffer_txt  dw      ?                       ;offset of start of text part
                                C
                                C
                                C
                                C  ;       Station and group lists
                                C
                                C
                                C  ; Note that various code walks through the stn_rec and grp_rec using lods
                                C  ; instructions which must be changed if fields are added or removed.
```

```
                        level_four_interface

                    C  ; Search for "stn_" or "grp_" to find those occurences.
                    C
                    C
090C  4C 49 53 54 53    C                  db      'LISTS'                 ;debug marker
                    C
= 0001              C  ch_stn              equ     1                       ;stn list changed
= 0002              C  ch_stn_atr          equ     2                       ;stn list attributes changed
= 0004              C  ch_grp              equ     4                       ;grp list changed
= 0008              C  ch_grp_atr          equ     8                       ;grp list attributes changed
                    C
0911  05            C  lists_chgd          db      ch_stn+ch_grp           ;station/group list changed flags
                    C
                    C
0912  0000          C  stn_list_size       dw      0                       ;current size of station list, +0
0914  01            C  stn_count           db      1                       ;count of stations
0915  00            C  rumor_count         db      0                       ;count of rumors
                    C
0916  0258 [         C  stn_list            db      max_stn_list dup(?)     ;station list, with variable-length
            ??
                ]   C
                    C
                    C                                                      ; records as follows:
                    C  stn_rec             struc
0000  ??            C  stn_addr            db      ?                       ;station addr, or zero if end
0001  ??            C  stn_flags           db      ?                       ;station flags -- see below
0002  ????          C  stn_groupmask       dw      ?                       ;group membership mask
0004  ??            C  stn_name1           db      ?                       ;length of following name
0005  ?? ??         C  stn_name            db      ?,?;...                 ;station name
0007                C  stn_rec             ends
= 0005              C  stn_rec_fsize       equ     5                       ;length of fixed part of stn_rec
                    C
                    C  ; The stn_groupmask is a set of bits representing group membership.  If the
                    C  ; first (msb) is on, we are a member of the first group in the group list,
                    C  ; and so on for up to 16 (max_groups) groups.
                    C
                    C  ; stn_flags bits:
                    C
= 0080              C  rumor               equ     80h                     ;this stn is only a rumor, i.e.
                    C  ;                                                   ;we got it from someone else
                    C
                    C
0B6E  0005          C  grp_list_size       dw      5                       ;current size of group list, +0
0B70  01            C  grp_count           db      1                       ;count of groups
                    C
0B71  03 41 4C 4C 00    C  grp_list        db      3,"ALL",0
0B76      C8 [      C                     db      max_grp_list dup (?)    ;group list, with records:
            ??
                ]   C
                    C
                    C
                    C  grp_rec             struc
0000  ??            C  grp_name1           db      ?                       ;length of name
0001  ?? ??         C  grp_name            db      ?,?;...                 ;group name
0003                C  grp_rec             ends
```

```
                        level_four_interface

= 0001                  C  grp_rec_fsize   equ     1                       ;length of fixed part of grp_rec
                        C
0C3E     11 [           C  grp_number_map  db      max_groups+1 dup (0)    ;group number map[1..16]
            00          C
                 ]      C
                        C
                        C
                        C
                        C  ; Destination of messages.
                        C  ; Represents the relative group or station number (1..n) to which
                        C  ; messages should be sent.
                        C
0C4F  01                C  dest_grp        db      1                       ;relative group number
0C50  01                C  dest_stn        db      1                       ;relative station number
0C51  00                C  is_dest_stn     db      0                       ;1 if destination is stn
                        C
0C52  ??                C  send_ok_count   db      ?                       ;count of successful sends
0C53  ??                C  send_ng_count   db      ?                       ;count of unsuccessful sends
                        C
                        C
                        C  ;       Network stuff
                        C
                        C
0C54  4E 57             C                  db      'NW'                    ;debug marker
0C56  ??                C  rcv_arcnet      db      ?                       ;arcnet addr of stn rcvd from
0C57  ??                C  snd_arcnet      db      ?                       ;arcnet addr of stn sent to
0C58  00                C  brdcst_arcnet   db      0                       ;arcnet addr of stn which broadcast
0C59  ??                C  our_arcnet      db      ?                       ;our arcnet address
0C5A  ??                C  rcv_msg_type    db      ?                       ;incoming message type
0C5B  ??                C  last_open_rcv   db      ?                       ;last time we did open_recv
                        C                                                  ;  (low bits of clock only)
0C5C  0D04              C  wks             dw      talk_wks                ;our well-known socket
                        C                                                  ;  (modified by channel number)
0C5E  00 00 00 00       C  rcv_rb          dd      0                       ;ptrs to transport level
0C62  00 00 00 00       C  snd_rb          dd      0                       ;   request blocks (rbs)
0C66  ????????          C  l4_publics      dd      ?                       ;ptr to L4 publics
0C6A  0000              C  our_l4_debug    dw      0                       ;the l4 debug value
0C6C  ????????          C  old_l4_exit     dd      ?                       ;existing l4 exit rtn
                        C
                        C
                        C
                        C  ;       DOS stuff
                        C
                        C
0C70  44 4F 53          C                  db      'DOS'                   ;debug marker
0C73  ????              C  psp             dw      ?                       ;ptr to dos psp
                        C
0C75  ????????          C  old_key_vector  dd      ?                       ;existing key interrupt rtn
0C79  ????????          C  old_time_vec    dd      ?                       ;existing timer interrupt rtn
                        C
0C7D  0000              C  ticks           dw      0                       ;count of timer ticks
                        C
0C7F  0000              C  tweedle_ptr     dw      0                       ;offset into tweedle array
                        C
```

```
                        level_four_interface

0C81  08 0A 08 00       C  tweedle1     db      8,10,8,0            ;ROLM-like phone for background msg
0C85  0E 0C 0B 00       C  tweedle2     db      14,12,11,0          ;low-med-high for window popup
0C89  09 00             C  tweedle3     db      9,0                 ;short beep for incoming msg
0C8B  04 03 02 00       C  tweedle4     db      4,3,2,0             ;chirp for new user
0C8F  3C 3C 00          C  tweedle5     db      60,60,0             ;low boop for failure to send
0C92  0F 0F 0F 0B 0B 0B C  tweedle6     db      15,15,15,11,11,11   ;ambulance sound for errors
0C98  0F 0F 0F 0B 0B 0B C               db      15,15,15,11,11,11,0
      00                C
                        C
0C9F  0A                C  kb10         db      10
0CA0  0444              C  kw1092       dw      1092                ;18.2 * 60 for time conversion
                        C
                        C
                        C  ;       Task stacks
                        C  ;
                        C  ; Note that ALL stacks must be large, because the keyboard interrupt process
                        C  ; can be recursive without bound when the keyboard buffer overflows.  This is
                        C  ; a serious and fatal flaw in the rom bios.  Try it with virgin ibm software!
                        C  ; You too can crash your machine by typing fast!
                        C  ;
                        C
0CA2  53 54 41 43 4B 53 C               db      'STACKS'            ;debug marker
0CA8  0258 [            C               db      600 dup(70h)        ;0: keyboard interrupt process
            70          C
              ]         C
                        C
0F00                    C  stack0       label   word
0F00  0258 [            C               db      600 dup(71h)        ;1: keyboard process
            71          C
              ]         C
                        C
1158                    C  stack1       label   word
1158  0258 [            C               db      600 dup(72h)        ;2: receive process
            72          C
              ]         C
                        C
13B0                    C  stack2       label   word
13B0  0258 [            C               db      600 dup(73h)        ;3: send process
            73          C
              ]         C
                        C
1608                    C  stack3       label   word
                        C
                        C
                        C  ;
                        C  ; Window buffers.  At some point we could move them to between the resident
                        C  ; code and the initialization code, so they can be shrunk to fit.
                        C  ; At the moment they are exactly the size needed and are part of the resident
                        C  ; segment.
                        C  ;
                        C  ; Note that the size of the user window can be changed by an invocation
                        C  ; parameter, and the size of the display window changes to accomodate it.
                        C  ; Thus the boundaries between the various windows may not be exactly as
                        C  ; shown below, but the total space will be no more than what we allocate.
```

```
                                level_four_interface

                              C  ;
                              C  ; Remember to change the window definitions up above if you change window
                              C  ; sizes, and also check the initialization code.
                              C  ;
                              C
1608  53 43 52 45 45 4E      C                  db      'SCREENS'               ;debug marker
      53                      C
                              C
160F                          C  window_buffers  label   byte                    ;start of all the window buffers
160F                          C  group_window    label   byte                    ;start of the group window
                              C
                              C  ;               #pages      height      width    2 bytes per char
                              C  ;               -------    --------   --------  --
160F  01BC [                  C          db         1     * (2-0+1)  * (78-5+1) * 2 dup (?)  ;the group window
            ??                C
               ]              C
                              C
17CB  01BC [                  C          db         1     * (4-2+1)  * (78-5+1) * 2 dup (?)  ;the station window
            ??                C
               ]              C
                              C
1987  1D7C [                  C          db      n_pages  * (20-4+1)  * (78-5+1) * 2 dup (?)  ;the display window
            ??                C
               ]              C
                              C
3703  0250 [                  C          db         1     * (23-20+1)* (78-5+1) * 2 dup (?)  ;the typing window
            ??                C
               ]              C
                              C
                              C
                              C
3953                          C  vseg            ends
                              C

0000                             cseg            segment public 'code'
                                                 assume  cs:cgrp,es:nothing,ds:nothing

                                                 public  send_task,rcv_task,kb_task
                                                 public  key_int_rtn,timer_int_rtn
                                                 public  to_hex,release_rbs,talk_exit
                                                 public  l4_entries,al4locate,l4_exit_rtn

                                 ;-----------------------------------------------------------------------------
                                 ;
                                 ;       Level 4 Initialization Routines.
                                 ;
                                 ;-----------------------------------------------------------------------------

                                                 subttl

                                 ;;              include e:l4loc.asm
                                                 .list
```

```
                        page

                        ;-----------------------------------------------------------------------------
                        ;-----------------------------------------------------------------------------
                        ;
                        ;  Keyboard task
                        ;
                        ;       Open and close windows as required.
                        ;       Read a line from the keyboard, displaying it in the typing window.
                        ;       When done, queue it to be transmitted to all stations, and then
                        ;       move it to the display window.  Repeat.
                        ;
                        ;       If the station list has changed, redisplay the station window.
                        ;
                        ;-----------------------------------------------------------------------------
                        ;-----------------------------------------------------------------------------
                                %out    -----kb_task

00B5                    kb_task         proc    near


                         $do                    ;-------- keyboard task infinite loop --------
                                                 *

                                    $do                 ;until we can shut down the tasks

                        ;       Open windows if requested to do so and no other rb's are active
                        ;       and we are not in the timer or 14 interrupt routines

00B5  2E: F6 06 0023 R 01                       test    do_open,1               ;request to open windows?
                                                 $ifnot z                       ;yes
00BD  2E: A0 001F R                              mov    al,14_exit_busy         ;in 14 exit?
00C1  2E: 0A 06 001E R                           or     al,timer_int_busy       ;or timer int?
00C6  2E: 0A 06 0021 R                           or     al,other_conn_busy      ;or open connection?
                                                 $if    z                       ;no: ok
00CD  2E: C6 06 0023 R 00                          mov  do_open,0               ;clear window open request
00D3  E8 00FC R                                    call process_kb              ;process keyboard commands
                                                 $endif
                                                $endif

                        ;       Process messages in the background until everything is quiet

00D6  E8 0E69 R                                 call    dispatch                ;run other tasks
00D9  2E: A0 001D R                             mov     al,recv_busy            ;until nothing being received
00DD  2E: 0A 06 0026 R                          or      al,open_recvd           ;or about to be
00E2  2E: 0A 06 001C R                          or      al,send_busy            ;or going out

                                     $repeatuntil z



                        ;       Shut down the tasks

00E9  2E: C6 06 0024 R 01                       mov     do_stop,1               ;flag to stop tasks
```

```
                                        $do
00EF  E8 0E69 R                           call  dispatch
00F2  2E: F6 06 0024 R 01                 test  do_stop,1             ;and wait until it happened
                                        $repeatuntil z

                        |       $repeat              ;-------- end infinite loop ----------

00FC                            kb_task         endp
```

```
                                page
                        ;-----------------------------------------------------------------------
                        ;
                        ;   Process keyboard:   Open the windows, read lines until "Q", then
                        ;                       close the windows.
                        ;
                        ;-----------------------------------------------------------------------

00FC                    process_kb      proc    near
00FC  8C C8                             mov     ax,cs
00FE  8E D8                             mov     ds,ax
0100  8E C0                             mov     es,ax
                                        assume  ds:cgrp,es:cgrp

                        ;       Open the windows

0102  B8 0604                           mov     ax,select_gwin
0105  E8 0000 E                         call    window                  ;open group window
0108  B4 01                             mov     ah,window_open
010A  E8 0000 E                         call    window
                                        $if     c                       ;if it failed (graphics mode)
010F  8D 06 0C92 R                        lea   ax,tweedle6
0113  A3 0C7F R                           mov   tweedle_ptr,ax          ;error sound
0116  E9 0387 R                           jmp   process_kb_ret          ;and return
                                        $endif
0119  B8 0603                           mov     ax,select_swin
011C  E8 0000 E                         call    window                  ;open station window
011F  B4 01                             mov     ah,window_open
0121  E8 0000 E                         call    window
0124  B8 0601                           mov     ax,select_dwin
0127  E8 0000 E                         call    window                  ;open display window
012A  B4 01                             mov     ah,window_open
012C  E8 0000 E                         call    window
012F  B0 04                             mov     al,4                    ;do an "END" page operation
0131  B4 09                             mov     ah,window_pageop
0133  E8 0000 E                         call    window
0136  B8 0602                           mov     ax,select_twin
0139  E8 0000 E                         call    window                  ;open typing window
013C  B4 01                             mov     ah,window_open
013E  E8 0000 E                         call    window
0141  C6 06 0022 R 01                   mov     windows_open,1          ;flag: windows open


                         $do    ;--------------------                   ;repeat until Q

                        ;       Read a line from the keyboard

0146  B0 3A                             mov     al,":"                  ;print ":"
0148  E8 0D92 R                         call    w_print
014B  BE 0000           zero_line:      mov     si,0                    ;buffer index
014E  89 36 0905 R                      mov     kbd_prevbufptr,si       ;previous buffer pointer
0152  C6 06 0907 R 00                   mov     kbd_prev_ins,0          ;not insert mode
```

```
                        ;               Wait for a key

0157  C7 06 0C7D R 0000                 mov     ticks,0                 ;reset the tick counter

015D                    get_kb_char:    $do
015D  E8 0E69 R                           call  dispatch                ;dispatch tasks
0160  80 3E 0911 R 00                     cmp   lists_chgd,0            ;has the stationlist changed?
                                          $ifnot e
0167  E8 0397 R                            call show_stations           ;yes: display the new list
016A  C6 06 0911 R 00                      mov  lists_chgd,0            ;  and reset the flag
                                          $endif

016F  F6 06 0029 R 01                     test  popped_up,1             ;did windows popup automatically?
                                          $ifnot z
0176  F6 06 002D R 01                     test  auto_popdown,1          ;does he want auto-popdown?
                                          $ifnot z
017D  A1 0C7D R                             mov ax,ticks                ;yes: check if time expired
0180  3B 06 002E R                          cmp ax,popdown_time
                                            $if ae
0186  46                                     inc si                     ;(so : is erased)
0187  E9 034B R                              jmp do_close               ;do auto-popdown close of windows
                                            $endif
                                          $endif
                                          $endif

018A  B4 01                               mov   ah,key_stat
018C  CD 16                               int   key_int                 ;any key pressed?
                                        $repeatwhile z                  ;no... keep trying

0190  B4 00                             mov     ah,key_read
0192  CD 16                             int     key_int                 ;read the key

0194  C6 06 0029 R 00                   mov     popped_up,0             ;cancel auto-popdown

                        ;       Process special characters

0199  3C 08                             cmp     al,bs                   ;************  backspace?
                                        $if     e
019D  83 FE 00                            cmp   si,0
01A0  74 BB                               je    get_kb_char             ;ignore it if at start of input buffer
01A2  E8 0D92 R                           call  w_print                 ;otherwise print bs
01A5  4E                                  dec   si                      ;and decrement index
                                          $if   c                       ;word wrap backspace:
                                            $do                         ;  move to after 1st nonblank
01A8  80 BC 005F R 20                         cmp kbd_buffer[si],'
                                              $exitif ne
01AF  4E                                      dec si
                                            $repeatuntil s
01B2  46                                    inc si
                                          $endif                        ;word wrap
01B3  EB A8                               jmp   short get_kb_char
```

```
                                        $endif                          ;backspace


01B5  3C 0A                             cmp     al,lf                   ;*************  ignore linefeeds
01B7  74 A4                             je      get_kb_char

01B9  3C 07                             cmp     al,bell                 ;*************  ignore bells
01BB  74 A0                             je      get_kb_char


01BD  3C 1B                             cmp     al,esc                  ;**************   escape?
                                        $if     e
01C1  8B CE                               mov   cx,si
01C3  B0 08                               mov   al,bs                   ;print bs until start of buffer
                                          $do   cxnz
01C7  E8 0D92 R                            call w_print
                                          $repeatloop
01CC  E9 014B R                           jmp   zero_line
                                        $endif


01CF  3A 06 005D R                      cmp     al,keychar              ;***************  trigger char
01D3  75 0E                               jne   not_trig
01D5  0A C0                             or      al,al
                                        $if     z
01D9  3A 26 005E R                        cmp   ah,keychar_scan         ;(also check extended scancode)
01DD  75 04                               jne   not_trig
                                        $endif
01DF  46                                inc     si                      ;(so that ":" is erased)
01E0  E9 034B R                         jmp     do_close
01E3                            not_trig:

01E3  3D 4800                           cmp     ax,key_up               ;****************  up-arrow key:
                                        $if     e                       ;           group destination
01E8  C6 06 0C51 R 00                     mov   is_dest_stn,0           ;not stn destination
01ED  80 0E 0911 R 0A                     or    lists_chgd,ch_grp_atr+ch_stn_atr
01F2  E9 015D R                           jmp   get_kb_char
                                        $endif


01F5  3D 5000                           cmp     ax,key_down             ;*****************  down-arrow key:
                                        $if     e                       ;            stn destination
01FA  C6 06 0C51 R 01                     mov   is_dest_stn,1           ;yes stn destination
01FF  80 0E 0911 R 0A                     or    lists_chgd,ch_grp_atr+ch_stn_atr
0204  E9 015D R                           jmp   get_kb_char
                                        $endif


0207  3D 4D00                           cmp     ax,key_right            ;*****************  right-arrow key:
                                        $if     e                       ;         next destination
020C  F6 06 0C51 R 01                     test  is_dest_stn,1
                                          $ifnot z                      ;next station
                                  if not show_rumors
                                     $do
```

```
                                        endif
0213  A0 0C50 R                                mov al,dest_stn
0216  FE C0                                    inc al
0218  3A 06 0914 R                             cmp al,stn_count
                                               $if a
021E  B0 01                                     mov al,1
                                               $endif
0220  A2 0C50 R                                mov dest_stn,al
                                        if not show_rumors
                                                call is_dest_rumor          ;is it a rumor?
                                               $repeatuntil z               ;yes - try next
                                        endif
0223  80 0E 0911 R 02                           or   lists_chgd,ch_stn_atr
                                              $else                         ;next group
022B  A0 0C4F R                                mov  al,dest_grp
022E  FE C0                                    inc  al
0230  3A 06 0B70 R                            cmp  al,grp_count
                                               $if  a
0236  B0 01                                     mov al,1
                                               $endif
0238  A2 0C4F R                               mov   dest_grp,al
023B  80 0E 0911 R 0A                         or    lists_chgd,ch_grp_atr+ch_stn_atr
                                              $endif
0240  E9 015D R                              jmp     get_kb_char
                                             $endif


0243  3D 4B00                                cmp     ax,key_left           ;*****************  left-arrow key:
                                             $if     e                     ;       previous destination
0248  F6 06 0C51 R 01                          test  is_dest_stn,1
                                               $ifnot z                     ;previous station
                                        if not show_rumors
                                                $do
                                        endif
024F  A0 0C50 R                                 mov al,dest_stn
0252  FE C8                                     dec al
                                                $if z
0256  A0 0914 R                                  mov al,stn_count
                                                $endif
0259  A2 0C50 R                                 mov dest_stn,al
                                        if not show_rumors
                                                call is_dest_rumor          ;is it a rumor?
                                               $repeatuntil z               ;yes: try previous
                                        endif
025C  80 0E 0911 R 02                           or   lists_chgd,ch_stn_atr
                                              $else                         ;previous group
0264  A0 0C4F R                                mov  al,dest_grp
0267  FE C8                                    dec  al
                                               $if  z
026B  A0 0B70 R                                 mov al,grp_count
                                               $endif
026E  A2 0C4F R                                mov  dest_grp,al
0271  80 0E 0911 R 0A                          or   lists_chgd,ch_grp_atr+ch_stn_atr
                                              $endif
```

```
0276  E9 015D R                        jmp     get_kb_char
                                       $endif


0279  3D 3B00                          cmp     ax,key_f1               ;*****************  F1 key:
                                       $if     e                       ;        copy previous buffer char
027E  3B 36 0903 R                       cmp   si,kbd_prevbufsiz
                                         $if   l
0284  8A 84 00EE R                         mov al,kbd_buffer_prev[si]  ;use it if it exists
0288  32 E4                                xor ah,ah
                                         $else
028D  E9 015D R                           jmp  get_kb_char             ;otherwise ignore
                                         $endif
                                       $endif


0290  3D 3D00                          cmp     ax,key_f3               ;******************  F3 key:
                                       $if     e                       ;        copy previous buffer
0295  8B 0E 0903 R                      mov   cx,kbd_prevbufsiz        ;amount in previous buffer
0299  2B CE                              sub   cx,si                    ;less amount typed in this buffer
                                         $if   g                       ;if something left
029D  8D BC 005F R                         lea  di,kbd_buffer[si]      ;copy to end of current buffer
02A1  8D B4 00EE R                         lea  si,kbd_buffer_prev[si] ;move tail of previous buffer
                                           $do
02A5  AC                                    lods kbd_buffer            ;move characters
02A6  AA                                    stos kbd_buffer_prev
02A7  E8 0D92 R                             call w_print               ;and print them
                                           $repeatloop
02AC  8B 36 0903 R                         mov  si,kbd_prevbufsiz      ;# of characters now in buffer
                                         $endif
02B0  E9 015D R                        jmp     get_kb_char
                                       $endif


02B3  3D 4700                          cmp     ax,key_home             ;HOME key
                                       $if     e
02B8  B3 03                              mov   bl,3
02BA  B8 0601                do_pageop:  mov   ax,select_dwin           ;select display window
02BD  E8 0000 E                          call  window
02C0  8A C3                              mov   al,bl                   ;pageop code
02C2  B4 09                              mov   ah,window_pageop
02C4  E8 0000 E                          call  window
02C7  B8 0602                            mov   ax,select_twin          ;reselect typing window
02CA  E8 0000 E                          call  window
02CD  E9 015D R                          jmp   get_kb_char
                                       $endif

02D0  3D 4F00                          cmp     ax,key_end              ;**************  END key
                                       $if     e
02D5  B3 04                              mov   bl,4
02D7  EB E1                              jmp   short do_pageop
                                       $endif

02D9  3D 4900                          cmp     ax,key_pgup             ;**************  PGUP key
                                       $if     e
```

```
02DE  B3 01                                   mov   bl,1
02E0  EB D8                                   jmp   short do_pageop
                                            $endif

02E2  3D 5100                               cmp     ax,key_pgdn             ;***************  PGDN key
                                            $if     e
02E7  B3 02                                   mov   bl,2
02E9  EB CF                                   jmp   short do_pageop
                                            $endif

02EB  0A C0                                 or      al,al                   ;Ignore all other extended codes
                                            $if     z
02EF  E9 015D R                               jmp   get_kb_char
                                            $endif


                            ;       Store and display the character


02F2  88 84 005F R                          mov     kbd_buffer[si],al       ;store char in buffer
02F6  46                                    inc     si                      ;update input buffer index

02F7  3C 0D                                 cmp     al,cr                   ;carriage return ends the line
02F9  74 10                                 je      got_line
02FB  81 FE 008F                            cmp     si,kbd_bufsize          ;check for buffer overflow
                                            $if     l
0301  E8 0D92 R                               call  w_print                 ;not: display it
                                            $else
0307  4E                                      dec   si                      ;else pin at end-of-buffer
                                            $endif
0308  E9 015D R                             jmp     get_kb_char


                            ;       Check for "Q" or "q" and return if so

030B  83 FE 02              got_line:       cmp     si,2
030E  75 0E                                 jne     not_quit
0310  80 3E 005F R 51                       cmp     kbd_buffer,"Q"
                                            $exitif e
0317  80 3E 005F R 71                       cmp     kbd_buffer,"q"
                                            $exitif e
031E                        not_quit:


                            ;       Process the line


031E  B0 0D                                 mov     al,cr                   ;echo cr
0320  E8 0D92 R                             call    w_print
0323  83 FE 01                              cmp     si,1                    ;is line null?  (just cr)
                                            $ifnot  e
0328  C6 06 0054 R 01                       mov     kbd_buffer_full,1       ;no: signal buffer full to send_task
032D  8B CE                                 mov     cx,si                   ;copy to "previous" buffer
032F  49                                    dec     cx                      ; (without CR)
```

```
0330  89 0E 0903 R                          mov     kbd_prevbufsiz,cx
0334  8D 36 005F R                          lea     si,kbd_buffer
0338  8D 3E 00EE R                          lea     di,kbd_buffer_prev
033C  F3/ A4                                rep     movsb
                                            $do
033E  E8 0E69 R                               call  dispatch
0341  F6 06 0054 R 01                        test   kbd_buffer_full,1       ;and wait until kbd_buffer is free
                                            $repeatuntil z
                                            $endif                          ;null check

                             $repeat        ;--------------------           ;repeat until Q

034B                         do_close:
034B  B0 08                                 mov     al,bs                   ;simulate backspace over
034D  8B CE                                 mov     cx,si                   ; anything in the buffer
                                            $do     cxnz
0351  E8 0D92 R                               call  w_print                 ;  example: ":q"
                                            $repeatloop


                             ;       Close the windows and return

0356  B8 0602                               mov     ax,select_twin
0359  E8 0000 E                            call    window                  ;close typing window
035C  B4 02                                 mov     ah,window_close
035E  E8 0000 E                            call    window
0361  B8 0601                               mov     ax,select_dwin
0364  E8 0000 E                            call    window                  ;close display window
0367  B4 02                                 mov     ah,window_close
0369  E8 0000 E                            call    window
036C  B8 0603                               mov     ax,select_swin
036F  E8 0000 E                            call    window                  ;close station window
0372  B4 02                                 mov     ah,window_close
0374  E8 0000 E                            call    window
0377  B8 0604                               mov     ax,select_gwin
037A  E8 0000 E                            call    window                  ;close group window
037D  B4 02                                 mov     ah,window_close
037F  E8 0000 E                            call    window
0382  C6 06 0022 R 00                       mov     windows_open,0          ;flag: windows close

0387                         process_kb_ret:
0387  C3                                   ret

0388                         process_kb     endp
```

```
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                        ;-----------------------------------------------------------------------
                        ;
                        ; show_stations        Display known or rumored stations in the station-window,
                        ;                      and groups in the group window.  Highlight the current
                        ;                      destination station or group (and station members).
                        ;                      Underline the station being sent to, if any.
                        ;
                        ;                      Use lists_chgd bits to know what has changed.  Try to
                        ;                      minimize window glitching by overwriting instead of
                        ;                      clearing and rewriting the windows when possible.
                        ;
                        ;                      Destroys ax, bx, cx, dx.
                        ;
                        ;-----------------------------------------------------------------------

0388  47 72 6F 75 70 73 show_stn_grpmsg db      'Groups: '
      3A 20
= 0008                  show_stn_grpmsgl equ    $-show_stn_grpmsg

0390  55 73 65 72 73 3A show_stn_usrmsg db      'Users: '
      20
= 0007                  show_stn_usrmsgl equ    $-show_stn_usrmsg

0397                    show_stations   proc
0397  56                                push    si

0398  F6 06 0911 R 0C           test    lists_chgd,ch_grp+ch_grp_atr    ;any group changes?
                          $if     z
039F  E9 042D R             jmp   show_stn_stns
                          $endif


                        ;       Do group window

03A2  B8 0604                       mov     ax,select_gwin          ;select the group window
03A5  E8 0000 E                     call    window
03A8  F6 06 0911 R 04               test    lists_chgd,ch_grp       ;must be complete rewrite?
                                    $ifnot  z
03AF  B0 0D                           mov   al,cr                   ;yes: clear it with CR
03B1  E8 0D92 R                       call  w_print
                                    $endif
03B4  BA 0101                       mov     dx,0101h                ;cursor to start
03B7  B4 05                         mov     ah,window_setcurs
03B9  E8 0000 E                     call    window
03BC  F6 06 0C51 R 01               test    is_dest_stn,1           ;if group destination,
                                    $if     z
03C3  B4 08                           mov   ah,window_setattr
03C5  A0 0033 R                       mov   al,char_bold            ;set bold
03C8  E8 0000 E                       call  window
                                    $endif
03CB  8D 36 0388 R                  lea     si,show_stn_grpmsg      ;print initial message
03CF  B9 0008                       mov     cx,show_stn_grpmsgl
```

```
                                        $do
03D2  AC                                  lodsb
03D3  E8 0D92 R                           call  w_print                 ;"Groups: "
                                        $repeatloop
03D8  B4 08                             mov     ah,window_setattr
03DA  A0 0032 R                         mov     al,char_normal
03DD  E8 0000 E                         call    window

03E0  8D 36 0B71 R                      lea     si,grp_list
03E4  32 DB                             xor     bl,bl                 ;group counter
                                        $do
03E6  FE C3                               inc   bl                    ;count next group
03E8  AC                                  lods  grp_list.grp_namel    ;length of name
03E9  0A C0                               or    al,al
                                          $exitif z                   ;done if zero
                                        if      assert
03ED  3C 10                               cmp   al,max_namesize
                                          $if   g                     ;internal error!
03F1  8B DE                                 mov bx,si
03F3  8A C8                                 mov cl,al
03F5  32 ED                                 xor ch,ch
03F7  B0 02                                 mov al,2
03F9  E8 0E0A R                             call int_error
03FC  EB 2F 90                              jmp show_stn_stns
                                          $endif
                                        endif
03FF  32 ED                               xor   ch,ch
0401  8A C8                               mov   cl,al                 ;length of name to cx
0403  F6 06 0C51 R 01                     test  is_dest_stn,1         ;group destination currently?
                                          $if   z
040A  3A 1E 0C4F R                         cmp  bl,dest_grp           ;this group?
                                           $if  e
0410  B4 08                                 mov ah,window_setattr
0412  A0 0033 R                             mov al,char_bold           ;yes: set bold
0415  E8 0000 E                             call window
                                           $endif
                                          $endif
                                          $do
0418  AC                                   lods grp_list.grp_name     ;print it
0419  E8 0D92 R                            call w_print
                                          $repeatloop
041E  B4 08                               mov   ah,window_setattr
0420  A0 0032 R                           mov   al,char_normal
0423  E8 0000 E                           call  window
0426  B0 20                               mov   al," "                ;blank as separator
0428  E8 0D92 R                           call  w_print
                                        $repeat                       ;next group


                              ;       Do station window

042D  B8 0603                 show_stn_stns:  mov     ax,select_swin  ;select the station window
0430  E8 0000 E                               call    window
0433  F6 06 0911 R 01                         test    lists_chgd,ch_stn ;must be complete rewrite?
```

```
                                $ifnot  z
043A  B0 0D                       mov   al,cr                   ;yes: clear the window with CRs
043C  8A 0E 0044 R                mov   cl,swin_bottom_row      ; number of CRs needed
0440  2A 0E 0042 R                sub   cl,swin_top_row         ; is 2*(bottom-top-1)-1,
0444  32 ED                       xor   ch,ch                   ; or 2*(bottom-top)-3.
0446  D1 E1                       sal   cx,1                    ; (Derivation left, naturally,
0448  83 E9 03                    sub   cx,3                    ;  as an exercise for the reader.)
                                  $do
044B  E8 0D92 R                    call w_print
                                  $repeatloop
                                $endif
0450  BA 0101                   mov     dx,0101h                ;cursor to start
0453  B4 05                     mov     ah,window_setcurs
0455  E8 0000 E                 call    window

0458  F6 06 0C51 R 01           test    is_dest_stn,1           ;if single user destination,
                                $ifnot  z
045F  B4 08                       mov   ah,window_setattr
0461  A0 0033 R                  mov   al,char_bold            ;set bold
0464  E8 0000 E                  call window
                                $endif
0467  8D 36 0390 R              lea     si,show_stn_usrmsg      ;print initial message
046B  B9 0007                   mov     cx,show_stn_usrmsgl
                                $do
046E  AC                          lodsb
046F  E8 0D92 R                   call  w_print                 ;"Users: "
                                $repeatloop
0474  B4 08                     mov     ah,window_setattr
0476  A0 0032 R                 mov     al,char_normal
0479  E8 0000 E                 call    window

047C  8D 36 0916 R              lea     si,stn_list             ;pointer into station table
0480  32 DB                     xor     bl,bl                   ;station counter
                              $do                               ;loop for all station recs
0482  FE C3                     inc     bl                      ;count next station

0484  AC                        lods    stn_list.stn_addr       ;station address
0485  0A C0                     or      al,al
                                $exitif z                       ;end of list if zero
0489  8A F0                     mov     dh,al                   ;dh=station address

048B  AC                        lods    stn_list.stn_flags      ;station flags
048C  8A D0                     mov     dl,al                   ;save in dl
                                if      not show_rumors
                                  test  dl,rumor                ;is it a rumor?
                                  jnz   show_stn_next           ;yes: don't show it
                                endif

048E  AD                        lods    stn_list.stn_groupmask  ;get groupmask in ax
048F  8A 16 0032 R              mov     dl,char_normal          ;default character attribute
0493  3A 36 0C57 R              cmp     dh,snd_arcnet           ;are we sending to this station
                                $if     e                       ; right now?
0499  8A 16 0034 R                mov   dl,char_line            ; yes: underline it
                                $endif
```

```
049D  F6 06 0C51 R 01                    test    is_dest_stn,1           ;is destination a stn?
                                         $ifnot  z
04A4  3A 1E 0C50 R                         cmp   bl,dest_stn             ;yes. this stn?
04A8  74 0C                                je    show_stn_bold           ;yes: bold it
                                         $else
04AD  8A 0E 0C4F R                         mov   cl,dest_grp             ;number of destination group
04B1  F8                                   clc
04B2  D3 D0                                rcl   ax,cl                   ;look at that groupmask bit
                                           $if   c                       ;if on, bold it
04B6  8A 16 0033 R           show_stn_bold:  mov  dl,char_bold           ;set bold
04BA  3A 36 0C57 R                           cmp  dh,snd_arcnet          ;are we sending to this station
                                             $if  e                      ; right now?
04C0  8A 16 0035 R                            mov dl,char_boldline; yes: bold underline
                                             $endif
                                           $endif
                                         $endif
04C4  B4 08                              mov     ah,window_setattr       ;set normal, bold, underline,
04C6  8A C2                              mov     al,dl                   ; or bold underline
04C8  E8 0000 E                          call    window

04CB  AC                                 lods    stn_list.stn_namel      ;length of name
                                         if      assert
04CC  3C 10                                cmp   al,max_namesize
                                           $if   g                       ;internal error!
04D0  8B DE                                  mov bx,si
04D2  8A C8                                  mov cl,al
04D4  32 ED                                  xor ch,ch
04D6  B0 03                                  mov al,3
04D8  E8 0E0A R                              call int_error
04DB  EB 23 90                               jmp show_stn_z
                                           $endif
                                         endif
04DE  98                                 cbw
04DF  8B C8                              mov     cx,ax
                                         $do
04E1  AC                                   lods  stn_list.stn_name
04E2  E8 0D92 R                            call  w_print                 ,print the name
                                         $repeatloop
04E7  F6 C2 80                           test    dl,rumor                ;is this stn only a rumor?
                                         $ifnot  z
04EC  B0 3F                                mov   al,"?"                  ;yes: flag it
04EE  E8 0D92 R                            call  w_print
                                         $endif
04F1  B4 08                              mov     ah,window_setattr
04F3  A0 0032 R                          mov     al,char_normal          ;unbold
04F6  E8 0000 E                          call    window
04F9  B0 20                              mov     al," "
04FB  E8 0D92 R                          call    w_print                 ;blank as separator
04FE                         show_stn_next:
                                       $repeat

0500  B8 0602                show_stn_z: mov     ax,select_twin          ;return to the typing window
0503  E8 0000 E                         call    window
0506  5E                                pop     si
```

```
0507  C3                                ret
0508                            show_stations   endp


                                ;
                                ; is_dest_rumor         Is the dest_stn a rumor?  Return NZ if so.
                                ;
                                ;       Destroys: cx
                                ;

                                                if      not show_rumors
                                is_dest_rumor   proc    near
                                                push    si
                                                lea     si,stn_list             ;start of station list
                                                xor     ch,ch
                                                mov     cl,dest_stn
                                                dec     cl                      ;dest_stn is origin 1
                                                $do     cxnz
                                                  mov   bl,[si].stn_namel       ;skip to next station
                                                ;assert bl<>0
                                                  xor   bh,bh
                                                  lea   si,stn_rec_fsize[si+bx]
                                                $repeatloop                     ;count stations
                                                test    [si].stn_flags,rumor    ;set NZ if rumor
                                                pop     si
                                                ret
                                is_dest_rumor   endp
                                                endif

                                                assume  ds:nothing,es:nothing
```

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                        ;-----------------------------------------------------------------------------
                        ;-----------------------------------------------------------------------------
                        ;
                        ; Network receive task
                        ;                               .
                        ;       Receive a station-list and text message.
                        ;       Add the stations to our list, and display the message.
                        ;
                        ;       If a broadcast is received, signal the send task to send a
                        ;       station-list
                        ;
                        ;-----------------------------------------------------------------------------
                        ;-----------------------------------------------------------------------------
                                %out    -----rcv_task

0508                    rcv_task        proc    near
0508  2E: C5 36 0C5E R                 lds     si,rcv_rb               ;get ptr to receive rb in ds:si
050D  8C C8                           mov     ax,cs
050F  8E D8                           mov     ds,ax                   ;ds:=cs
0511  8E C0                           mov     es,ax                   ;es:=cs
                                      assume  ds:cgrp,es:cgrp



                                $do     ;**********************;infinite loop of receive task

0513  E8 0767 R                       call    recv_message            ;get a message

0516  80 3E 0C5A R 99                 cmp     rcv_msg_type,genl_msg_type
                                      $if     e                       ;---regular text message
051D  E8 055E R                         call  process_msg             ;process stn list and text
                                      $endif

0520  80 3E 0C5A R 98                 cmp     rcv_msg_type,logon_msg_type
                                      $if     e                       ;---logon broadcast message
0527  E8 055E R                         call  process_msg             ;process the stationlist part
                                        $do                           ;now send our stationlist to him
052A  E8 0E69 R                           call dispatch
052D  80 3E 0C58 R 00                     cmp  brdcst_arcnet,0        ;wait if any prior send is queued
                                        $repeatuntil e
0534  A0 0C56 R                         mov   al,rcv_arcnet
0537  A2 0C58 R                         mov   brdcst_arcnet,al;queue this one
                                      $endif

053A  80 3E 0C5A R 97                 cmp     rcv_msg_type,logoff_msg_type
                                      $if     e                       ;---logoff message
0541  8A 1E 0C56 R                     mov   bl,rcv_arcnet
0545  E8 0C68 R                        call  stn_lookup              ;lookup it's name (stn=bl)
                                        $ifnot z                      ;if found,
054A  E8 0CC0 R                           call stn_remove             ;delete it
                        ;;bug: if dest_stn is >= removed station, it was changed!
054D  80 0E 0911 R 01                     or   lists_chgd.ch_stn      ;bug coverup;  should fix this!
```

```
0552  C6 06 0C50 R 01                        mov  dest_stn,1
                                            $endif
                                          $endif

0557  C6 06 001D R 00                      mov     recv_busy,0          ;clear busy flag

                                    $repeat ;************************    ;end infinite loop of receive task

055E                           rcv_task    endp
```

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                        ;-----------------------------------------------------------------------
                        ;
                        ; process_msg   Process the incoming message.
                        ;
                        ;               Messages are a sequence of message subtypes, ending
                        ;               with a message subtype of zero.
                        ;
                        ;-----------------------------------------------------------------------

055E                    process_msg     proc
055E  8D 3E 017D R                      lea     di,rcv_buffer           ;di points into buffer always

                                $do                                     ;process all subtypes

0562  8A 05                             mov     al,[di]                 ;get subtype
0564  47                                inc     di
0565  0A C0                             or      al,al
                                        $exitif z                       ;stop if zero

0569  3C BB                             cmp     al,grp_subtype          ;process according to subtype
                                        $if     e
056D  E8 0599 R                           call  process_grp_msg
                                        $else
0573  3C AA                             cmp     al,stn_subtype
                                        $if     e
0577  E8 060E R                           call  process_stn_msg
                                        $else
057D  3C CC                             cmp     al,txt_subtype
                                        $if     e
0581  E8 06FD R                           call  process_txt_msg
                                        $else                           ;bad subtype
                                          if    assert
0587  8A 3E 0C56 R                         mov   bh,rcv_arcnet
058B  8A D8                               mov   bl,al
058D  8B CF                               mov   cx,di
058F  B0 01                               mov   al,1                    ;internal error code 1
0591  E8 0E0A R                           call  int_error
0594  EB 02                               jmp   short process_msg_z
                                          endif
                                        $endif
                                        $endif
                                        $endif

                                $repeat

0598  C3                       process_msg_z:  ret
0599                           process_msg     endp
```

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                                ;
                                ;       GROUP-LIST MESSAGE SUBTYPE
                                ;
                                ;       Add his group names to our table, if we are missing any of them.
                                ;       At the same time, construct a table to map his relative group
                                ;       numbers into ours, so that we can remap the groupmask in his
                                ;       station records to match ours.
                                ;
                                ;       di points to the groupname message subtype in the receive buffer,
                                ;       and is updated to point to the next message subtype when we're done.
                                ;

0599                            process_grp_msg proc    near

0599  B2 00                              mov     dl,0                    ;his relative group number
                                          $do                             ;repeat for all his groups

059B  FE C2                                       inc     dl                      ;increment his group number
059D  8A 0D                                       mov     cl,[di].grp_namel       ;length of his groupname
059F  0A C9                                       or      cl,cl
                                                  $exitif z                       ;done if zero
05A3  80 C1 01                                    add     cl,grp_rec_fsize;cx=size of his whole grp_rec
05A6  32 ED                                       xor     ch,ch

                                ;       Lookup group name to see if we have it already

05A8  8D 36 0B71 R                                lea     si,grp_list             ;start of our group list
05AC  B6 00                                       mov     dh,0                    ;our relative group number
                                                  $do                             ;repeat for all our groups
05AE  FE C6                                        inc    dh                      ;increment our group number
05B0  8A 1C                                        mov    bl,[si].grp_namel       ;length of our group name
05B2  0A DB                                        or     bl,bl
                                                   $exitif z                      ;no more: not found
05B6  57                                           push   di
05B7  56                                           push   si
05B8  51                                           push   cx
05B9  F3/ A6                                       repe   cmpsb                   ;compare names
05BB  59                                           pop    cx
05BC  5E                                           pop    si
05BD  5F                                           pop    di
05BE  74 2E                                        je     pr_grp_found            ;found
05C0  32 FF                                        xor    bh,bh
05C2  8D 70 01                                     lea    si,grp_rec_fsize[si+bx] ;skip to next group of ours
                                                  $repeat

                                ;       Add new group name to our list

05C7  57                                          push    di                      ;not found...
05C8  51                                          push    cx
05C9  01 0E 0B6E R                                add     grp_list_size,cx;add to our group list
05CD  81 3E 0B6E R 00C8                           cmp     grp_list_size,max_grp_list  ;(if it fits)
                                                  $if     b
```

```
05D5  FE 06 0B70 R                      inc   grp_count               ;one more group name
05D9  87 F7                             xchg  si,di
05DB  F3/ A4                            rep   movsb                   ;move the name
05DD  32 C0                             xor   al,al
05DF  AA                                stos  grp_list                ;add ending zero
05E0  80 0E 0911 R 04                   or    lists_chgd,ch_grp       ;flag grouplist changed
                                      $else
05E8  29 0E 0B6E R                      sub   grp_list_size,cx
                                      $endif
05EC  59                              pop     cx
05ED  5F                              pop     di

                        ;       Create group map such that grp_number_map[his_group] = our_group

05EE  8A DA             pr_grp_found: mov     bl,dl                   ;his group number
05F0  32 FF                           xor     bh,bh
05F2  88 B7 0C3E R                    mov     grp_number_map[bx],dh   ;map to our group number

05F6  03 F9                           add     di,cx                   ;move to his next group

                              $repeat

                              if assert                               ;fill out the rest of his
05FA  32 FF                           xor     bh,bh                   ;  group map with zero
05FC  8A DA                           mov     bl,dl                   ;his group number
                                      $do
05FE  80 FB 10                          cmp   bl,16
                                        $exitif e
0603  FE C3                             inc   bl
0605  C6 87 0C3E R 00                   mov   grp_number_map[bx],0
                                      $repeat
                              endif
060C  47                              inc     di                      ;point at next subtype

060D  C3                              ret

060E                    process_grp_msg endp
```

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                        ;
                        ;       STATION-LIST MESSAGE SUBTYPE
                        ;
                        ;       Add his known stations to our list.   He himself is not a rumor,
                        ;       but all the other stations he sends are considered to be rumors.
                        ;       Add any group membership he knows that we don't.
                        ;
                        ;       di points to the station-list part of the message and is updated
                        ;       to point after it.
                        ;
060E                    process_stn_msg proc    near

                            $do                                         ;for all his stn_rec's
060E  80 3D 00                  cmp     [di].stn_addr,0                 ;0 stn addr is end-of-list
                                $if     e
0613  E9 0697 R                   jmp   proc_stn_end
                                $endif

                        ;       Remap his groupmap to our group numbering

0616  33 C9                             xor     cx,cx                   ;remap this groupmask
0618  8B 45 02                          mov     ax,[di].stn_groupmask   ;  to our ordering
061B  33 D2                             xor     dx,dx                   ;dx=new groupmask
                                        $do
061D  41                                  inc   cx                      ;his relative group number
061E  0A E4                               or    ah,ah
                                          $if   s                       ;it is a member of that group
0622  8B D9                                mov  bx,cx
0624  8A 9F 0C3E R                        mov   bl,grp_number_map[bx]   ;get our number for it
0628  D1 E3                               shl   bx,1
                                          if    assert
                                          $if   z
062C  B0 04                                mov al,4                     ;bad group bit in rcvd msg
062E  E8 0E0A R                            call int_error
                                          $endif
                                          endif
0631  0B 97 069C R                        or    dx,group_bits[bx]       ;turn on our bit for it
                                        $endif
0635  D1 E0                               shl   ax,1                    ;next bit
0637  83 F9 10                           cmp   cx,16
                                        $repeatuntil    e
063C  89 55 02                          mov     [di].stn_groupmask,dx   ;store the translated map

                        ;       Look up the station in our list, and add it if necessary

063F  8A 1D                             mov     bl,[di].stn_addr;get the stn addr
0641  3A 1E 0C56 R                      cmp     bl,rcv_arcnet           ;he himself?

                                        $if     e                       ;sender:
0647  E8 0C68 R                           call  stn_lookup              ;look him up
                                          $if   z
```

```
064C  80 65 01 7F                                  and  [di].stn_flags,255-rumor;not found: add him as non-rumor
0650  E8 0C84 R                                    call stn_add
0653  8D 06 0C8B R                                 lea  ax,tweedle4              ;special tweedle for new users
0657  A3 0C7F R                                    mov  tweedle_ptr,ax
                                                  $else
065D  F6 44 01 80                                  test [si].stn_flags,rumor     ;found: was he a rumor before?
                                                   $ifnot z
0663  80 64 01 7F                                   and [si].stn_flags,255-rumor;yes: make him a non-rumor
0667  FE 0E 0915 R                                  dec rumor_count
066B  80 0E 0911 R 01                               or  lists_chgd,ch_stn         ;and flag the list as changed
                                                   $endif
0670  E8 06BE R                                    call chk_stn_changes          ;check for name/group changes
                                                  $endif

                                                 $else                           ;not sender:
0676  80 4D 01 80                                  or    [di].stn_flags,rumor    ;  treat as a rumor
067A  E8 0C68 R                                    call  stn_lookup              ;lookup that station
                                                   $if   z
067F  E8 0C84 R                                     call stn_add                 ;not found: add it as a rumor
                                                   $else
0685  8B 45 02                                      mov  ax,[di].stn_groupmask   ;found: add any new groups
0688  09 44 02                                      or   [si].stn_groupmask,ax
                                                   $endif
                                                 $endif

068B  8A 45 04                                   mov     al,[di].stn_namel       ;move past this entry
068E  83 C7 05                                   add     di,stn_rec_fsize
0691  98                                         cbw
0692  03 F8                                      add     di,ax
                                               $repeat                           ;for all his stations


0697                                proc_stn_end:
0697  E8 0CF7 R                                 call    group_purge              ;purge any unused groups

069A  47                                         inc     di                       ;point at next subtype
069B  C3                                         ret

069C  0000 8000 4000 2000            group_bits  dw      0,8000h,4000h,2000h,1000h,0800h,0400h,0200h,0100h
      1000 0800 0400 0200
      0100
06AE  0080 0040 0020 0010                        dw        0080h,0040h,0020h,0010h,0008h,0004h,0002h,0001h
      0008 0004 0002 0001

06BE                                process_stn_msg endp
```

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                        ;
                        ; chk_stn_changes     Check for any name or group membership changes for
                        ;                     the station from whom we just received a msg.
                        ;                     Adjust (and/or move) the stn_list record if so.
                        ;
                        ;       Input:  si points to our stn_list record for him
                        ;               di points to his stn_list record for himself
                        ;
                        ;       Destroys: ax, bx, cx, si
                        ;                 (si is not really destroyed, but the stn_list may be
                        ;                  reordered, so si might not point at what it used to.
                        ;

06BE                    chk_stn_changes proc    near
06BE  8B 45 02                  mov     ax,[di].stn_groupmask   ;any group changes?
06C1  3B 44 02                  cmp     ax,[si].stn_groupmask
                                $ifnot e                        ;yes: use new groups
06C6  89 44 02                   mov    [si].stn_groupmask,ax
06C9  C6 06 0911 R 02            mov    lists_chgd,ch_stn_atr
                                $endif
06CE  8A 4C 04                  mov     cl,[si].stn_namel       ;compare names
06D1  FE C1                     inc     cl                      ; (and namelengths)
06D3  32 ED                     xor     ch,ch
06D5  33 DB                     xor     bx,bx
                                $do
06D7  8A 40 04                    mov   al,stn_namel[si+bx]
06DA  3A 41 04                    cmp   al,stn_namel[di+bx]
                                  $ifnot e                      ;different: he changed his name!
06DF  F6 06 001C R 01              test send_busy,1             ;rearrange stations only if
                                   $if  z                       ;  send task is not using it!
06E6  8A 44 01                      mov al,stn_flags[si];copy our flags for him
06E9  88 45 01                      mov stn_flags[di],al
06EC  E8 0CC0 R                     call stn_remove             ;remove and re-add the stn_rec
06EF  E8 0C84 R                     call stn_add
06F2  C6 06 0C50 R 01               mov dest_stn,1              ;(hack!)
                                   $endif
06F7  EB 03                        jmp short chk_stn_ch_xit
                                  $endif
06F9  43                          inc   bx
                                $repeatloop
06FC  C3                chk_stn_ch_xit: ret

06FD                    chk_stn_changes endp
```

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                                ;
                                ;       TEXT MESSAGE SUBTYPE
                                ;
                                ;       Process the text part of the message, which is the form:
                                ;
                                ;          from <right_arrow >to: text... <CR>
                                ;
06FD                            process_txt_msg proc    near

06FD  80 3D 0D                          cmp     byte ptr [di],cr;don't do null text messages

                                    $ifnot      e


                                ;       Make the appropriate noise, and force window popup sometimes

0702  F6 06 0022 R 01                   test    windows_open,1
                                        $ifnot  z
0709  8D 06 0C89 R                       lea   ax,tweedle3             ;if windows are open
                                        $else
0710  F6 06 002B R 01                    test  auto_popup,1
                                         $ifnot z
0717  C6 06 0023 R 01                     mov do_open,1                ;if windows are to popup
071C  C6 06 0029 R 01                     mov popped_up,1
0721  8D 06 0C85 R                        lea ax,tweedle2
                                         $else
0728  8D 06 0C81 R                        lea ax,tweedle1              ;if windows stay closed
                                         $endif
                                        $endif
072C  A3 0C7F R                         mov     tweedle_ptr,ax


072F  B8 0601                           mov     ax,select_dwin          ;select display window
0732  E8 0000 E                        call    window
0735  E8 0DC9 R                        call    do_timestamp            ;print timestamp, maybe
0738  B4 08                            mov     ah,window_setattr
073A  A0 0033 R                         mov     al,char_bold            ;set bold characters
073D  E8 0000 E                         call    window

                                        $do                             ;now the message
0740  8A 05                              mov   al,byte ptr [di];get a character
0742  47                                 inc   di
0743  3C 0D                             cmp   al,cr
                                         $exitif e                      ;stop at cr
0747  E8 0D92 R                          call  w_print                  ;display it
074A  3C 3A                              cmp   al,':'                   ;was it the colon?
                                         $if   e                        ;yes: switch to normal chars
074E  B4 08                               mov  ah,window_setattr
0750  A0 0032 R                           mov  al,char_normal
0753  E8 0000 E                           call window
                                         $endif
```

```
                                        $repeat
0758  B4 08                              mov     ah,window_setattr
075A  A0 0032 R                         mov     al,char_normal
075D  E8 0000 E                         call    window
0760  B8 0602                          mov     ax,select_twin          ;reselect typing window
0763  E8 0000 E                         call    window

                                      $endif                            ;null message check

0766  C3                                ret

0767                          process_txt_msg endp

                                        assume  ds:nothing,es:nothing
```

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                        ;-----------------------------------------------------------------------------
                        ;
                        ; recv_message          Receive a message into rcv_buffer.
                        ;                       Sets rcv_arcnet and  rcv_msg_type.
                        ;                       Destroys ax.
                        ;
                        ;-----------------------------------------------------------------------------

0767                    recv_message    proc    near
0767  1E                              push    ds
0768  56                              push    si
0769  2E: C5 36 0C5E R                lds     si,rcv_rb               ;get rb in ds:si

076E                    recv_wait:
                                        $do
076E  E8 0E69 R                           call  dispatch
0771  C7 44 40 017D R                     mov   [si].recv_ptr, offset cgrp:rcv_buffer   ;buffer addr
0776  8C C8                               mov   ax,cs
0778  89 44 42                            mov   [si].recv_ptr+2,ax
077B  C7 44 44 03C3                       mov   [si].recv_limit,rcv_bufsize             ;buffer size
0780  2E: A1 0C5C R                       mov   ax,wks
0784  89 44 30                            mov   [si].hdr_src_socket,ax                  ;listen socket
0787  2E: F6 06 0026 R 01                 test  open_recvd,1            ;recv already true from kb int?
                                          $exitif nz                    ;yes: don't call again
                                          14_call open_recv

                                        $repeatuntil c                  ;wait for incoming message
0796  2E: C6 06 0026 R 01               mov     open_recvd,1            ;signal message incoming
079C  2E: C6 06 001D R 01               mov     recv_busy,1             ;and our task busy

                                        $do                             ;watchout for race condition:
07A2  2E: F6 06 0024 R 01                 test  do_stop,1               ; keyboard may already be trying
                                          $exitif z                     ; to shutdown the task dispatcher
07AA  E8 0E69 R                           call  dispatch
                                        $repeat

07AF  2E: C6 06 0026 R 00               mov     open_recvd,0            ;clear open_recv pending flag

07B5  80 7C 55 00                       cmp     [si].his_bcst,0         ;if it wasn't a broadcast,
                                        $if     z                       ;  then acknowledge it now
                                        14_call ack_now
                                        $do                             ;churn until ack done
07C0  E8 0E69 R                          call   dispatch
                                         14_call 14churn
07C8  8A 44 3E                           mov    al,[si].recv_status
07CB  3C 05                              cmp    al,tf_in_prog
                                        $repeatwhile e
07CF  3C 00                             cmp     al,tf_idle              ;should be idle
07D1  75 18                             jne     rcv_abort
                                        $endif

                                        14_call recv_msg                ;receive it
```

```
                                        $do
07D8  E8 0E69 R                         call    dispatch
                                        14_call 14churn                 ;churn until receive done
07E0  8A 44 3E                          mov     al,[si].recv_status
07E3  3C 05                             cmp     al,tf_in_prog
                                        $repeatwhile e

07E7  3C 00                             cmp     al,tf_idle              ;should be idle now
                                        $ifnot  e
07EB                            rcv_abort:       14_call abort_conn     ;receive error: abort connection
07F0  2E: C6 06 001D R 00       rcv_try_again:   mov     recv_busy,0    ;  signal nothing in progress
07F6  E9 076E R                          jmp     recv_wait              ;  and keep waiting
                                        $endif

07F9  8A 44 54                          mov     al,[si].his_arc         ;save his arcnet address
07FC  2E: A2 0C56 R                     mov     rcv_arcnet,al
0800  8A 44 3F                          mov     al,[si].recv_type       ;save message type
0803  2E: A2 0C5A R                     mov     rcv_msg_type,al

0807  2E: 80 3E 0C5A R 96               cmp     rcv_msg_type,rqscrn_msg_type
080D  74 3C                             je      send_screen             ;special request type
080F  2E: 80 3E 0C5A R 94               cmp     rcv_msg_type,kbchar_msg_type
0815  74 7B                             je      rcv_key                 ;special request type

0817  2E: 80 3E 0C5A R 98               cmp     rcv_msg_type,logon_msg_type
                                        $if     e
                                         14_call abort_conn             ;abort broadcast messages
                                        $else
0827  E8 082D R                          call    rcv_disconn            ;disconnect all others
                                        $endif

082A  5E                                pop     si
082B  1F                                pop     ds
082C  C3                                ret


082D                            rcv_disconn:     14_call disconn        ;disconnect
                                        $do
0832  E8 0E69 R                           call  dispatch
                                          14_call 14churn               ;churn until not connected
083A  8A 44 08                            mov   al,[si].conn_status
083D  3C 00                               cmp   al,cn_established
                                        $repeatwhile e
0841  3C 01                             cmp     al,cn_not_conn          ;check for errors
                                        $ifnot  e
                                          14_call abort_conn            ;and abort if so
                                        $endif
084A  C3                                ret


084B  C6 44 33 95               send_screen:     mov     [si].hdr_data_type,scrn_msg_type
084F  C7 44 0A 0000                              mov     [si].send_ptr,0
0854  C7 44 0C B000                              mov     [si].send_ptr+2,0b000h  ;assume b/w screen
```

```
0859  CD 11                                int     equip_int               ;equipment determination
085B  24 30                               and     al,30h                  ;00 = no card, use b/w
                                          $ifnot  z
085F  3C 30                                cmp    al,30h                  ;11 = b/w screen
                                           $ifnot z
0863  C7 44 0C B800                        mov    [si].send_ptr+2,0b800h  ;01,10 = color screen
                                           $endif
                                          $endif
0868  C7 44 0E 0FA0                       mov     [si].send_length,25*80*2
                                          l4_call send_msg
0872  E8 0E69 R                 send_scr_lp:  call    dispatch
                                          l4_call l4churn
087A  8A 44 09                            mov     al,[si].send_status
087D  3C 05                               cmp     al,tf_in_prog
087F  74 F1                                 je    send_scr_lp
0881  3C 06                               cmp     al,tf_ack_wait
0883  74 ED                                 je    send_scr_lp
0885  3C 00                               cmp     al,tf_idle
                                          $ifnot  e
0889  E9 07EB R                             jmp   rcv_abort
                                          $endif
088C  E8 082D R                           call    rcv_disconn             ;disconnect
088F  E9 07F0 R                           jmp     rcv_try_again           ;and wait for another msg


= 001A                          kb_buffer_head  equ     1ah
= 001C                          kb_buffer_tail  equ     1ch
= 0080                          kb_buffer_start equ     80h
= 0082                          kb_buffer_end   equ     82h

0892  06                        rcv_key:        push    es
0893  B8 0040                                  mov     ax,40h                  ;bios data area
0896  8E C0                                    mov     es,ax
0898  FA                                       cli                             ;disable ints
0899  26: 8B 1E 001C                           mov     bx,es:kb_buffer_tail
089E  83 C3 02                                 add     bx,2                    ;increment kb pointer
08A1  26: 3B 1E 0082                           cmp     bx,es:kb_buffer_end
                                               $if     e                       ;circularly
08A8  26: 8B 1E 0080                             mov   bx,es:kb_buffer_start
                                               $endif
08AD  26: 3B 1E 001A                           cmp     bx,es:kb_buffer_head
                                               $ifnot  e                       ;no buffer overflow
08B4  26: 87 1E 001C                             xchg  bx,es:kb_buffer_tail    ;store new ptr, get old
08B9  2E: A1 017D R                              mov   ax,word ptr cs:rcv_buffer ;get 1st char/scancode from buffer
08BD  26: 89 07                                  mov   es:[bx],ax              ;store char/scancode in buffer
                                               $else
                                                       ;buffer ovfl. Do what?
                                               $endif
08C3  FB                                       sti                             ;enable ints
08C4  07                                       pop     es
08C5  E8 082D R                                call    rcv_disconn             ;disconnect
08C8  E9 07F0 R                                jmp     rcv_try_again           ;and wait for another msg

08CB                            recv_message    endp
```

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                        ;-----------------------------------------------------------------------------
                        ;-----------------------------------------------------------------------------
                        ;
                        ; Network send task
                        ;
                        ;       If the keyboard buffer is full, send a queued text line to all stations,
                        ;       along with our list of known groups and stations.
                        ;
                        ;       If a broadcast response was queued, send only the station list.
                        ;
                        ;       If a send_msg request was queued from the kb_int function, send
                        ;       the buffer supplied.
                        ;
                        ;       If the rumor_count is non-zero, send test probes to determine
                        ;       the status of the rumors.
                        ;
                        ;-----------------------------------------------------------------------------
                        ;-----------------------------------------------------------------------------
                                %out    -----send_task

08CB                    send_task       proc    near
08CB  8C C8                             mov     ax,cs
08CD  8E D8                             mov     ds,ax           ;ds:=cs
08CF  8E C0                             mov     es,ax           ;es:=cs
                                        assume  ds:cgrp,es:cgrp


                        ; But first: Send a one-time-only broadcast message requesting station lists
                        ; from anyone out there.

08D1  C6 06 001C R 01                   mov     send_busy,1             ;we are busy
08D6  E8 0B36 R                         call    copy_lists              ;make up the station list (only us)
08D9  32 C0                             xor     al,al
08DB  AA                                stos    snd_buffer              ;end of subtypes
08DC  81 EF 0540 R                      sub     di,offset cgrp:snd_buffer  ;length of message
08E0  89 3E 0908 R                      mov     snd_buffer_size,di
08E4  C6 06 0C57 R FF                   mov     snd_arcnet,0ffh         ;broadcast destination
08E9  B4 98                             mov     ah,logon_msg_type       ;logon message type
08EB  E8 0BA9 R                         call    send_message            ;send it
08EE  C6 06 001C R 00                   mov     send_busy,0             ;we aren't busy any more


                                $do     ;***************        ;start send task infinite loop
08F3  E8 0E69 R                         call    dispatch


08F6  F6 06 0054 R 01                   test    kbd_buffer_full,1       ;keyboard buffer full?
                                        $ifnot  z
08FD  E8 0995 R                           call  send_kb_msg             ;yes: send keyboard message
                                        $endif
```

```
0900  80 3E 0C58 R 00                cmp     brdcst_arcnet,0         ;broadcast response queued?
                                     $ifnot  z
0907  C6 06 001C R 01                  mov   send_busy,1             ;we are busy
090C  E8 0B36 R                        call  copy_lists              ;make up the station list
090F  32 C0                            xor   al,al
0911  AA                               stos  snd_buffer              ;end of subtypes
0912  81 EF 0540 R                     sub   di,offset cgrp:snd_buffer  ;length of message
0916  89 3E 0908 R                     mov   snd_buffer_size,di
091A  B0 00                            mov   al,0
091C  86 06 0C58 R                     xchg  al,brdcst_arcnet;get station addr, reset queue
0920  A2 0C57 R                        mov   snd_arcnet,al
0923  B4 99                            mov   ah,genl_msg_type
0925  80 0E 0911 R 02                  or    lists_chgd,ch_stn_atr   ;force underline
092A  E8 0BA9 R                        call  send_message            ;send the response
092D  80 0E 0911 R 02                  or    lists_chgd,ch_stn_atr   ;remove underline
0932  C6 06 001C R 00                  mov   send_busy,0             ;we are not busy
                                     $endif


0937  80 3E 0027 R 00                cmp     send_msg_rqst,0         ;kb_int send-msg request?
                                     $ifnot  z
093E  C6 06 001C R 01                  mov   send_busy,1             ;yes: make this task busy
0943  C6 06 0027 R 00                  mov   send_msg_rqst,0         ;clear request
0948  8D 3E 0540 R                     lea   di,snd_buffer
094C  B0 CC                            mov   al,txt_subtype          ;send text-only message
094E  AA                               stos  snd_buffer
094F  1E                               push  ds
                                       assume ds:nothing
0950  2E: C5 36 0057 R                 lds   si,send_msg_ptr         ;ptr given by caller to kb_int
                                       $do
0955  AC                                lodsb
0956  AA                                stos snd_buffer              ;copy to output buffer
0957  3C 0D                             cmp  al,cr                   ;until CR
                                       $repeatuntil e
095B  1F                               pop   ds
                                       assume ds:cgrp
095C  32 C0                            xor   al,al
095E  AA                               stos  snd_buffer              ;end of subtypes
095F  81 EF 0540 R                     sub   di,offset cgrp:snd_buffer  ;length of message
0963  89 3E 0908 R                     mov   snd_buffer_size,di
0967  A0 005B R                        mov   al,send_msg_stn         ;station to send to
096A  A2 0C57 R                        mov   snd_arcnet,al
096D  B4 99                            mov   ah,genl_msg_type
096F  E8 0BA9 R                        call  send_message            ;send it
                                       $if   c
0974  C6 06 005C R 01                   mov  send_msg_stat,1         ;failed: change status
                                       $endif
0979  C6 06 001C R 00                   mov  send_busy,0
                                     $endif


097E  80 3E 0915 R 00                cmp     rumor_count,0           ;any rumors to verify
                                     $ifnot  e                       ;yes
0985  F6 06 0021 R 01                  test  other_conn_busy,1       ;other rb's active?
```

```
                                        $if   z                         ;no - can take time for this
098C  E8 0AC1 R                          call probe_rumors              ;determine rumor status
098F  E8 0CF7 R                          call group_purge               ;purge groups that became empty
                                        $endif
                                      $endif


                                $repeat ;**************         ;end of send task infinite loop

0995                          send_task       endp
```

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                        ;
                        ;       Construct and send a message to all known and rumored stations
                        ;
0995                    send_kb_msg     proc    near

                        ;       Copy the group-list and part of the station-list

0995  E8 0B36 R                        call    copy_lists              ;copy the station namelist

0998  B0 CC                             mov     al,txt_subtype          ;start text subtype
099A  AA                                stos    snd_buffer
099B  89 3E 090A R                      mov     snd_buffer_txt,di       ;save offset of text part


                        ;       Construct from-->to: header

099F  32 ED                             xor     ch,ch
09A1  8A 0E 091A R                      mov     cl,stn_list.stn_namel   ;length of our name
09A5  80 F9 08                          cmp     cl,8
                                        $if     g
09AA  B1 08                               mov   cl,8                    ;(max 8)
                                        $endif
09AC  8D 36 091B R                      lea     si,stn_list.stn_name
09B0  F3/ A4                            rep     movsb                   ;move it
09B2  B0 1A                             mov     al,26                   ;little right-arrow character
09B4  AA                                stos    snd_buffer
09B5  E8 0B6E R                         call    get_dest_rec            ;get destination namel in si
09B8  AC                                lodsb                           ;get length
09B9  8A C8                             mov     cl,al
09BB  80 F9 08                          cmp     cl,8
                                        $if     g
09C0  B1 08                               mov   cl,8                    ;(max 8)
                                        $endif
09C2  F3/ A4                            rep     movsb                   ;move it
09C4  B0 3A                             mov     al,":"
09C6  AA                                stos    snd_buffer              ;and colon


                        ;       Move keyboard text

09C7  8D 36 005F R                      lea     si,kbd_buffer           ;move keyboard buffer
                                        $do
09CB  AC                                  lods  kbd_buffer
09CC  AA                                  stos  snd_buffer
09CD  3C 0D                               cmp   al,cr                   ;until cr
                                        $repeatuntil e
09D1  32 C0                             xor     al,al
09D3  AA                                stos    snd_buffer              ;ending zero
09D4  81 EF 0540 R                      sub     di,offset cgrp:snd_buffer  ;length of message
09D8  89 3E 0908 R                      mov     snd_buffer_size,di
```

```
09DC  C6 06 001C R 01                   mov     send_busy,1             ;signal that we are busy
09E1  C6 06 0054 R 00                   mov     kbd_buffer_full,0       ;free the keyboard task
09E6  8D 36 0916 R                      lea     si,stn_list             ;point to station list


                              ;       Send to the destination stations

09EA  C6 06 0C52 R 00                   mov     send_ok_count,0         ;count of sucessful sends
09EF  C6 06 0C53 R 00                   mov     send_ng_count,0         ;count of unsucessful sends
09F4  8A 0E 0C4F R                      mov     cl,dest_grp             ;compute dx=group mask, if any
09F8  33 D2                             xor     dx,dx
09FA  F9                                stc
09FB  D3 DA                             rcr     dx,cl

09FD  8D 36 0916 R                      lea     si,stn_list             ;walk down station list
0A01  B1 01                             mov     cl,1                    ;and count them
                                    $do                                 ;for all stations

0A03  F6 06 0C51 R 01                   test    is_dest_stn,1           ;what kind of destination?
                                        $ifnot z                        ;station...
0A0A  3A 0E 0C50 R                        cmp   cl,dest_stn             ;yes: right one?
0A0E  75 59                               jne   send_next               ;  no: skip to next
0A10  EB 05                               jmp   short send_it           ;  yes: send it
                                        $endif
0A12  85 54 02                          test    dx,[si].stn_groupmask   ;group...
0A15  74 52                             jz      send_next               ;not member

0A17  8A 04                         send_it:    mov     al,[si].stn_addr;get station address
0A19  3A 06 0C59 R                      cmp     al,our_arcnet
                                        $if     e                       ;don't send to ourself
0A1F  EB 48                               jmp   short send_next         ; (do it with $if - I dare you!)
                                        $endif
0A21  A2 0C57 R                         mov     snd_arcnet,al
0A24  B4 99                             mov     ah,genl_msg_type;use text message type
0A26  80 0E 0911 R 02                   or      lists_chgd,ch_stn_atr   ;force underline
0A2B  E8 0BA9 R                         call    send_message            ;try to send it
0A2E  9C                                pushf
0A2F  80 0E 0911 R 02                   or      lists_chgd,ch_stn_atr   ;remove underline
0A34  9D                                popf
                                        $if     c                       ;failed:
0A37  FE 06 0C53 R                        inc   send_ng_count           ;   count it
0A3B  8D 06 0C8F R                        lea   ax,tweedle5             ;   speaker burp
0A3F  A3 0C7F R                           mov   tweedle_ptr,ax
0A42  E8 0CC0 R                           call  stn_remove              ;   remove this station
0A45  38 0E 0C50 R                        cmp   dest_stn,cl             ;   adjust if destination is it or later
                                          $if   ge
0A4B  FE 0E 0C50 R                         dec  dest_stn
                                          $endif
                                        $else                           ;succeeded:
0A52  FE 06 0C52 R                        inc   send_ok_count           ;   count it
0A56  F6 44 01 80                         test  [si].stn_flags,rumor    ;   was he a rumor?
                                          $ifnot z
0A5C  80 64 01 7F                           and [si].stn_flags,255-rumor;  yes: not any more!
```

```
0A60  FE 0E 0915 R                        dec rumor_count
0A64  80 0E 0911 R 01                     or  lists_chgd,ch_stn       ;  stationlist is changed
                                        $endif

0A69  8A 44 04                send_next:  mov   al,[si].stn_namel      ;skip to next stn_rec
0A6C  98                                  cbw
0A6D  03 F0                               add   si,ax
0A6F  83 C6 05                            add   si,stn_rec_fsize
0A72  FE C1                               inc   cl                    ;next station number
                                        $endif                        ;fail check

0A74  80 3C 00                            cmp   [si].stn_addr,0       ;continue 'til end of stn list
                                    $repeatuntil e

                              ;     If any sends failed and stations were removed from our list,
                              ;     check if any group names are now unused and may be removed.

0A79  80 3E 0C53 R 00                     cmp   send_ng_count,0
                                        $if   g
0A80  E8 0CF7 R                           call  group_purge
                                        $endif

                              ;     Print it in our window, if it was sent to at least one

0A83  80 3E 0C52 R 00                     cmp   send_ok_count,0
                                    $if   g
0A8A  B8 0601                             mov   ax,select_dwin
0A8D  E8 0000 E                           call  window                ;now print it in our display window
0A90  E8 0DC9 R                           call  do_timestamp          ;print timestamp, maybe
0A93  B4 08                               mov   ah,window_setattr
0A95  A0 0033 R                           mov   al,char_bold          ;set bold characters
0A98  E8 0000 E                           call  window
0A9B  8B 36 090A R                        mov   si,snd_buffer_txt     ;start of text part of msg
                                          $do
0A9F  AC                                    lods  snd_buffer          ;print the message
0AA0  3C 0D                                 cmp   al,cr
                                            $exitif e                 ;stop at cr
0AA4  E8 0D92 R                             call  w_print
0AA7  3C 3A                                 cmp   al,":"              ;stop bold after colon
                                            $if   e
0AAB  B4 08                                   mov  ah,window_setattr
0AAD  A0 0032 R                               mov  al,char_normal     ;normal characters
0AB0  E8 0000 E                               call window
                                            $endif
                                          $repeat
0AB5  B8 0602                             mov   ax,select_twin        ;return to typing window
0AB8  E8 0000 E                           call  window
                                    $endif

0ABB  C6 06 001C R 00                     mov   send_busy,0           ;signal we are not busy
0AC0  C3                                  ret
0AC1                          send_kb_msg endp
```

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                                page
                        ;-----------------------------------------------------------------------------
                        ;
                        ; probe_rumors  Send a silent message to each rumored station to find
                        ;               out whether or not it really exists.
                        ;
                        ;-----------------------------------------------------------------------------

0AC1                    probe_rumors    proc    near
0AC1  C6 06 001C R 01                   mov     send_busy,1
0AC6  C6 06 0540 R 00                   mov     snd_buffer,0            ;null message
0ACB  C7 06 0908 R 0001                 mov     snd_buffer_size,1       ;  is a single zero
0AD1  8D 36 0916 R                      lea     si,stn_list             ;walk station list
0AD5  B1 01                             mov     cl,1                    ;and count them
                              $do
0AD7  F6 44 01 80                       test    [si].stn_flags,rumor    ;a rumor?
                                        $if     z
0ADD  EB 3C                               jmp   short probe_next;no - skip to next
                                        $endif
0ADF  8A 04                             mov     al,[si].stn_addr;yes: send to it
0AE1  A2 0C57 R                         mov     snd_arcnet,al
0AE4  B4 99                             mov     ah,genl_msg_type
0AE6  80 0E 0911 R 02                   or      lists_chgd,ch_stn_atr   ;force underline
0AEB  E8 0BA9 R                         call    send_message            ;send
0AEE  9C                                pushf
0AEF  80 0E 0911 R 02                   or      lists_chgd,ch_stn_atr   ;remove underline
0AF4  9D                                popf
                                        $if     c                       ;failed:
0AF7  8D 06 0C8F R                        lea   ax,tweedle5             ;  speaker burp
0AFB  A3 0C7F R                           mov   tweedle_ptr,ax
0AFE  E8 0CC0 R                           call  stn_remove              ;  remove it
0B01  38 0E 0C50 R                        cmp   dest_stn,cl             ;  adjust destination if this or later
                                          $if   ge
0B07  FE 0E 0C50 R                         dec  dest_stn
                                          $endif
                                        $else                           ;succeeded:
0B0E  80 64 01 7F                         and   [si].stn_flags,255-rumor;  make him a non-rumor
0B12  FE 0E 0915 R                        dec   rumor_count
0B16  80 0E 0911 R 01                     or    lists_chgd,ch_stn       ;  stationlist is changed
0B1B  8A 44 04                  probe_next:     mov   al,[si].stn_namel ;  skip to next station
0B1E  98                                  cbw
0B1F  03 F0                               add   si,ax
0B21  83 C6 05                            add   si,stn_rec_fsize
0B24  FE C1                               inc   cl                      ;next station number
                                        $endif

0B26  80 3C 00                          cmp     [si].stn_addr,0         ;continue 'til end of stn list
                              $repeatuntil e
                                        ;assert rumor_count=0 already!
0B2B  C6 06 0915 R 00                   mov     rumor_count,0
0B30  C6 06 001C R 00                   mov     send_busy,0
0B35  C3                                ret
0B36                    probe_rumors    endp
```

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                        page
                        ;-----------------------------------------------------------------------
                        ;
                        ; copy_lists   Copy our group name list to the output buffer.
                        ;              Then copy a subset of our station list to the snd_buffer,
                        ;              including only non-rumored stations (stations that we have
                        ;              successfully communicated with).
                        ;
                        ;              Returns with offset into snd_buffer in di.
                        ;              Destroys ax, cx, si.
                        ;
                        ;-----------------------------------------------------------------------

0B36                    copy_lists      proc    near
0B36  8D 3E 0540 R                      lea     di,snd_buffer           ;index into send buffer

0B3A  B0 BB                             mov     al,grp_subtype          ;grp_list message subtype
0B3C  AA                                stos    snd_buffer
0B3D  8D 36 0B71 R                      lea     si,grp_list
0B41  8B 0E 0B6E R                      mov     cx,grp_list_size
0B45  F3/ A4                            rep     movsb                           ;move it

0B47  B0 AA                             mov     al,stn_subtype          ;stn_list message subtype
0B49  AA                                stos    snd_buffer
0B4A  8D 36 0916 R                      lea     si,stn_list             ;start of our station list
0B4E  B5 00                             mov     ch,0                    ;prepare for counting
                                $do                                     ;loop for all stations
0B50  F6 04 FF                          test    [si].stn_addr,0ffh
                                        $exitif z                       ;end of list
0B55  8A 4C 04                          mov     cl,[si].stn_namel       ;compute length of this rec
0B58  83 C1 05                          add     cx,stn_rec_fsize
0B5B  F6 44 01 80                       test    [si].stn_flags,rumor    ;rumor?
                                        $ifnot  z
0B61  03 F1                               add   si,cx                   ;rumor: skip it
                                        $else
0B66  F3/ A4                              rep   movsb                   ;not rumor: copy it
                                        $endif
                                $repeat                                 ;all stations
0B6A  B0 00                             mov     al,0
0B6C  AA                                stosb                           ;zero to mark end of list
0B6D  C3                                ret
0B6E                    copy_lists      endp
```

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                                page
                        ;-----------------------------------------------------------------------------
                        ;
                        ; get_dest_rec  Get the destination record (either grp_rec or stn_rec)
                        ;               of the current destination.
                        ;
                        ;               Return si pointing to (name_length,"name") entry of record.
                        ;               Destroys: ax, bx, cl
                        ;
                        ;-----------------------------------------------------------------------------

0B6E                    get_dest_rec    proc    near
0B6E  32 FF                             xor     bh,bh
0B70  B1 01                             mov     cl,1                    ;station/group counter

0B72  F6 06 0C51 R 01                   test    is_dest_stn,1
                                        $ifnot  z
0B79  8D 36 0916 R                        lea   si,stn_list             ;station destination
                                          $do
0B7D  3A 0E 0C50 R                         cmp  cl,dest_stn
                                           $exitif e                    ;got it...
0B83  8A 5C 04                             mov  bl,[si].stn_name1
0B86  8D 70 05                             lea  si,stn_rec_fsize[si+bx] ;move to next
0B89  FE C1                                inc  cl
                                          $repeat
0B8D  8D 74 04                            lea   si,stn_name1[si];return ptr to name_length

                                        $else
0B93  8D 36 0B71 R                        lea   si,grp_list             ;group destination
                                          $do
0B97  3A 0E 0C4F R                         cmp  cl,dest_grp
                                           $exitif e                    ;got it...
0B9D  8A 1C                                mov  bl,[si].grp_name1
0B9F  8D 70 01                             lea  si,grp_rec_fsize[si+bx] ;move to next
0BA2  FE C1                                inc  cl
                                          $repeat
0BA6  8D 34                               lea   si,grp_name1[si];return ptr to name_length
                                        $endif

0BA8  C3                                ret
0BA9                    get_dest_rec    endp

                                        assume  ds:nothing,es:nothing
```

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                        ;-----------------------------------------------------------------------------
                        ;
                        ; send_message         Send the snd_buffer, size snd_buffer_size
                        ;                     to the station snd_arcnet. (ff to broadcast).
                        ;                     Message type is in ah.
                        ;                     If not broadcast, return C if it fails, otherwise NC.
                        ;                     Destroys ax, bx.
                        ;
                        ;-----------------------------------------------------------------------------

0BA9                    send_message    proc    near
0BA9  1E                                push    ds
0BAA  56                                push    si

0BAB  2E: C5 36 0C66 R                  lds     si,l4_publics
0BB0  BB 0006                           mov     bx,timeout              ;set new short level2 timeouts
0BB3  87 5C 22                          xchg    bx,ds:[si].to_pkt_keep  ;(but save old values on the stack)
0BB6  53                                push    bx
0BB7  BB 0006                           mov     bx,timeout
0BBA  87 5C 24                          xchg    bx,ds:[si].to_ta_wait
0BBD  53                                push    bx

0BBE  2E: C5 36 0C62 R                  lds     si,snd_rb                       ;get rb in ds:si
0BC3  2E: A0 0C57 R                     mov     al,snd_arcnet
0BC7  88 44 54                          mov     [si].his_arc,al                 ;arcnet address
0BCA  88 64 33                          mov     [si].hdr_data_type,ah           ;type
0BCD  2E: 8B 1E 0908 R                  mov     bx,snd_buffer_size
0BD2  89 5C 0E                          mov     [si].send_length,bx             ;message length

0BD5  2E: 80 3E 0C57 R FF               cmp     snd_arcnet,0ffh
                                        $if     e                               ;broadcast:
0BDD  98                                  cbw                                   ;  address ffffff
0BDE  89 44 1E                            mov   [si].hdr_dest_host+0,ax
0BE1  89 44 20                            mov   [si].hdr_dest_host+2,ax
0BE4  89 44 22                            mov   [si].hdr_dest_host+4,ax
                                        $else
0BEA  C7 44 1E 0008                       mov   [si].hdr_dest_host+0,0008h      ;ethernet address
0BEF  C7 44 20 000A                       mov   [si].hdr_dest_host+2,000ah      ; 08000A0000aa
0BF4  C6 44 22 00                         mov   byte ptr[si].hdr_dest_host+4,0
0BF8  88 44 23                            mov   byte ptr[si].hdr_dest_host+5,al ;except low byte is arc
                                        $endif
0BFB  C7 44 0A 0540 R                   mov     [si].send_ptr,offset cgrp:snd_buffer     ;buffer address
0C00  8C C8                             mov     ax,cs
0C02  89 44 0C                          mov     [si].send_ptr+2,ax
0C05  2E: A1 0C5C R                     mov     ax,wks
0C09  89 44 24                          mov     [si].hdr_dest_socket,ax ;socket number

                                        l4_call connect                 ;try to connect and send

0C11  E8 0E69 R                 conn_wait:      call    dispatch        ;wait for connection
                                                l4_call l4churn
0C19  8A 44 09                          mov     al,[si].send_status
```

```
0C1C  3C 05                              cmp     al,tf_in_prog
0C1E  74 F1                                je    conn_wait
0C20  2E: 80 3E 0C57 R FF                cmp     snd_arcnet,0ffh        ;if broadcast,
0C26  74 20                                je    send_abort             ;abort now
0C28  3C 06                              cmp     al,tf_ack_wait
0C2A  74 E5                                je    conn_wait

0C2C  3C 00                              cmp     al,tf_idle
0C2E  75 18                                jne   send_abort             ;abort if not ok

                                         l4_call disconn                ;ok: disconnect

                                         $do
0C35  E8 0E69 R                            call  dispatch               ;wait for disconnect
                                           l4_call l4churn
0C3D  8A 44 09                             mov   al,[si].send_status
0C40  3C 00                                cmp   al,cn_established
                                         $repeatwhile e

0C44  3C 01                              cmp     al,cn_not_conn         ;disconnect ok?
                                         $ifnot  e
0C48                           send_abort:    l4_call abort_conn       ;no: abort the connection
0C4D  F9                                    stc                         ;return with C set
                                         $else
0C51  F8                                    clc                         ;ok: return with NC set
                                         $endif

0C52  2E: C5 36 0C66 R                   lds     si,l4_publics
0C57  5B                                 pop     bx
0C58  89 5C 24                           mov     ds:[si].to_ta_wait,bx  ;restore level2 timeouts
0C5B  5B                                 pop     bx                     ; (PRESERVE C/NC!)
0C5C  89 5C 22                           mov     ds:[si].to_pkt_keep,bx

0C5F  2E: C6 06 0C57 R 00                mov     snd_arcnet,0           ;clear out destination
                                                                        ;  for show_stations
0C65  5E                                 pop     si
0C66  1F                                 pop     ds
0C67  C3                                 ret
0C68                           send_message  endp
```

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                                page

                        ;-----------------------------------------------------------------------
                        ;
                        ;       Station list routines.   Called by both send and receive tasks.
                        ;
                        ;       These require ds=es=cs!   You have been warned!
                        ;
                        ;-----------------------------------------------------------------------

                                assume  ds:cgrp,es:cgrp

                        ;
                        ; stn_lookup    Lookup station address bl.
                        ;               Return NZ and offset to stn_rec in si if found.
                        ;               Return Z if not found.
                        ;               Destroys ax.
                        ;

0C68                    stn_lookup      proc    near
0C68  8D 36 0916 R                      lea     si,stn_list             ;start of station list

                                        $do
0C6C  8A 04                               mov   al,[si].stn_addr;get station addr
0C6E  0A C0                               or    al,al                   ;end?
0C70  74 11                               jz    stn_not_found           ;yes...
0C72  3A C3                               cmp   al,bl                   ;match?
0C74  74 0B                               je    stn_found               ;yes...
0C76  8A 44 04                            mov   al,[si].stn_namel       ;no: skip to next rec
0C79  98                                  cbw
0C7A  03 F0                               add   si,ax
0C7C  83 C6 05                            add   si,stn_rec_fsize
                                        $repeat                         ;and continue

0C81  0C 01             stn_found:      or      al,1                    ;set NZ
0C83  C3                stn_not_found:  ret                             ;return with Z/NZ set
0C84                    stn_lookup      endp


                        ;
                        ; stn_add       Add a station to the end of the list.
                        ;               On input, di points to the new stn_rec.
                        ;               Destroys ax, cx.
                        ;

0C84                    stn_add         proc    near
0C84  57                                push    di
0C85  56                                push    si
0C86  8B F7                             mov     si,di                   ;move from new entry
0C88  8D 3E 0915 R                      lea     di,stn_list-1           ;to zero byte at end of list
0C8C  03 3E 0912 R                      add     di,stn_list_size
0C90  B5 00                             mov     ch,0
0C92  8A 4C 04                          mov     cl,[si].stn_namel       ;length of name
0C95  83 C1 05                          add     cx,stn_rec_fsize;total size of entry to move
```

```
0C98  A1 0912 R                               mov     ax,stn_list_size
0C9B  03 C1                                   add     ax,cx                   ;new size of stn_list
0C9D  3D 0258                                 cmp     ax,max_stn_list
                                              $if     l                       ;not overflowing
0CA2  F6 44 01 80                               test  [si].stn_flags,rumor    ;adding a rumor?
                                                $ifnot z
0CA8  FE 06 0915 R                               inc  rumor_count             ;yes: count it
                                                $endif
0CAC  A3 0912 R                                 mov   stn_list_size,ax
0CAF  F3/ A4                                    rep   movsb                   ;move entire entry
0CB1  C6 05 00                                  mov   byte ptr [di],0         ;put a zero at the end
0CB4  80 0E 0911 R 01                           or    lists_chgd,ch_stn       ;  and flag changed stationlist
0CB9  FE 06 0914 R                              inc   stn_count               ;  and increment count
                                              $endif
0CBD  5E                                      pop     si
0CBE  5F                                      pop     di
0CBF  C3                                      ret
0CC0                          stn_add         endp


                              ;
                              ; stn_remove    Remove a station from the station list.
                              ;
                              ;               On entry, si points to the stn_rec to remove.
                              ;               On exit, si points to the following stn_rec.
                              ;               Destroys: ax.
                              ;
                              ;       Note:   Caller must be aware that dest_stn may be wrong
                              ;               after a station has been removed.
                              ;

0CC0                          stn_remove      proc
0CC0  56                                      push    si
0CC1  57                                      push    di
0CC2  51                                      push    cx
0CC3  F6 44 01 80                             test    [si].stn_flags,rumor    ;removing a rumor?
                                              $ifnot z
0CC9  FE 0E 0915 R                             dec    rumor_count             ;yes: uncount it
                                              $endif
0CCD  8A 44 04                                mov     al,[si].stn_namel       ;length of name
0CD0  04 05                                   add     al,stn_rec_fsize;total length of entry
0CD2  98                                      cbw
0CD3  8B FE                                   mov     di,si                   ;destination to slide to
0CD5  03 F0                                   add     si,ax                   ;source is next entry
0CD7  8B 0E 0912 R                            mov     cx,stn_list_size;compute amount to move
0CDB  81 C1 0916 R                            add     cx,offset cgrp:stn_list
0CDF  2B CE                                   sub     cx,si
0CE1  29 06 0912 R                            sub     stn_list_size,ax;update list size
0CE5  F3/ A4                                  rep     movsb                   ;slide
0CE7  C6 05 00                                mov     byte ptr [di],0         ;put zero at the end
0CEA  80 0E 0911 R 01                         or      lists_chgd,ch_stn       ;flag that stationlist changed
0CEF  FE 0E 0914 R                            dec     stn_count               ;and decrement count
0CF3  59                                      pop     cx
0CF4  5F                                      pop     di
```

```
0CF5  5E                                    pop     si
0CF6  C3                                    ret
0CF7                            stn_remove  endp



                                ;
                                ; group_purge   Look through the group lists and purge any groups which
                                ;               have no current members.
                                ;
                                ;               Destroys:  ax.
                                ;
0CF7                            group_purge     proc    near
0CF7  53                                        push    bx
0CF8  51                                        push    cx
0CF9  52                                        push    dx
0CFA  56                                        push    si
0CFB  57                                        push    di

0CFC  32 FF                                     xor     bh,bh                   ;BH always zero!

                                ;       OR together the group masks of all stations in dx

0CFE  8D 36 0916 R                              lea     si,stn_list             ;start of station list
0D02  33 D2                                     xor     dx,dx                   ;for OR of all group masks
                                                $do
0D04  80 3C 00                                    cmp   [si].stn_addr,0
                                                  $exitif e
0D09  0B 54 02                                    or    dx,[si].stn_groupmask
0D0C  8A 5C 04                                    mov   bl,[si].stn_namel
0D0F  8D 70 05                                    lea   si,stn_rec_fsize[si+bx]
                                                $repeat

                                ;       Loop through groups, and delete those without a bit on

0D14  8D 36 0B71 R                              lea     si,grp_list
0D18  B8 0001                                   mov     ax,1                    ;group counter in ax
                                                $do
0D1B  80 3C 00                                    cmp   [si].grp_namel,0
                                                  $exitif e
0D20  D1 E2                                       shl   dx,1                    ;look at its bit in dx
                                                  $ifnot c                      ;not on: not used!
0D24  80 0E 0911 R 04                               or    lists_chgd,ch_grp       ;flag groups changed
0D29  56                                            push si                       ;save loc of where next will be
0D2A  8B FE                                         mov  di,si                    ;destination to slide to
0D2C  8A 1C                                         mov  bl,[si].grp_namel
0D2E  8D 70 01                                      lea  si,grp_rec_fsize[si+bx] ;source is next grp_record
0D31  8B 0E 0B6E R                                  mov  cx,grp_list_size;compute amount to move
0D35  81 C1 0B71 R                                  add  cx,offset cgrp:grp_list
0D39  2B CE                                         sub  cx,si
0D3B  29 1E 0B6E R                                  sub  grp_list_size,bx;update list size
0D3F  83 2E 0B6E R 01                               sub  grp_list_size,grp_rec_fsize
```

```
0D44  F3/ A4                                    rep  movsb                    ;slide it
0D46  C6 05 00                                  mov  byte ptr [di],0         ;put zero at the end
0D49  FE 0E 0B70 R                              dec  grp_count               ;decrement count
0D4D  38 06 0C4F R                              cmp  dest_grp,al             ;if destination is it or later,
                                                $if  ge
0D53  FE 0E 0C4F R                               dec dest_grp                ;decrement it
                                                $endif
0D57  E8 0D6C R                                 call group_pur_fixstn;fix station groupmasks
0D5A  5E                                        pop  si                      ;restore ptr to slid entry
                                               $else
0D5E  8A 1C                                     mov  bl,[si].grp_namel       ;skip to next entry
0D60  8D 70 01                                  lea  si,grp_rec_fsize[si+bx]
0D63  40                                        inc  ax                      ;count group kept
                                               $endif
                                              $repeat
0D66  5F                                      pop     di                     ;restore regs and return
0D67  5E                                      pop     si
0D68  5A                                      pop     dx
0D69  59                                      pop     cx
0D6A  5B                                      pop     bx
0D6B  C3                                      ret


                              ;       Remove the bit for the removed group from all stations' groupmasks.
                              ;       ax is the group number.  Destroys si, cx, bl.

0D6C                          group_pur_fixstn:
0D6C  8D 36 0916 R                            lea     si,stn_list            ;start of station list
0D70  8B C8                                   mov     cx,ax                  ;save group # in cx
                                              $do
0D72  80 3C 00                                  cmp   [si].stn_addr,0
                                                $exitif e
0D77  8B 44 02                                  mov   ax,[si].stn_groupmask  ;get the mask
0D7A  F8                                        clc                          ;the zero bit to supply
0D7B  51                                        push  cx
0D7C  D3 D0                                       rcl ax,cl                  ;push the bit into C
0D7E  59                                        pop   cx
0D7F  51                                        push  cx
0D80  49                                          dec cx
0D81  D3 C8                                       ror ax,cl                  ;put other bits back
0D83  59                                        pop   cx
0D84  89 44 02                                  mov   [si].stn_groupmask,ax  ;put the mask back
0D87  8A 5C 04                                  mov   bl,[si].stn_namel      ;next station
0D8A  8D 70 05                                  lea   si,stn_rec_fsize[si+bx]
                                              $repeat
0D8F  8B C1                                   mov     ax,cx                  ;restore group # in ax
0D91  C3                                      ret

0D92                          group_purge     endp

                                              assume  ds:nothing,es:nothing
```

```
                                page

                        ;-----------------------------------------------------------------------------
                        ;
                        ;       UTILITY ROUTINES        Called by any task.
                        ;
                        ;-----------------------------------------------------------------------------
                                %out    -----utilities


                        ;
                        ;     w_print:  Print char in al in the window.  If cr, also prints lf.
                        ;               Destroys nothing.
                        ;
0D92                    w_print         proc    near
0D92  50                                push    ax
0D93  B4 03                             mov     ah,window_print
0D95  E8 0000 E                         call    window
0D98  58                                pop     ax
0D99  C3                                ret
0D9A                    w_print         endp


                        ;
                        ; w_print_dd    Print contents of al (0-99) in decimal.
                        ;               Destroys ax.
                        ;
0D9A                    w_print_dd      proc    near
0D9A  B4 00                             mov     ah,0
0D9C  2E: F6 36 0C9F R                  div     kb10            ;quotient in al, remainder in ah
0DA1  04 30                             add     al,'0'
0DA3  E8 0D92 R                         call    w_print
0DA6  8A C4                             mov     al,ah
0DA8  04 30                             add     al,'0'
0DAA  EB E6                             jmp     short w_print   ;print and return
0DAC                    w_print_dd      endp


                        ;
                        ; w_print_nn    Print contents of al as "nn" in hex.
                        ;               Destroys ax.
                        ;
0DAC                    w_print_nn      proc    near
0DAC  50                                push    ax
0DAD  D0 C8                             ror     al,1
0DAF  D0 C8                             ror     al,1
0DB1  D0 C8                             ror     al,1
0DB3  D0 C8                             ror     al,1
0DB5  E8 0DB9 R                         call    w_print_nibble  ;1st digit
0DB8  58                                pop     ax              ;now 2nd digit
```

```
E8 0DBE R                w_print_nibble: call    to_hex          ;convert to hex
EB D4                                    jmp     w_print         ;print digit and exit
                         w_print_nn      endp


                         ;
                         ; to_hex        convert al's low nibble to hex
                         ;
                         to_hex          proc    near
24 0F                                    and     al,0fh
3C 09                                    cmp     al,9
                                         $if     a
04 07                                      add   al,"A"-"9"-1
                                         $endif
04 30                                    add     al,"0"
C3                                       ret
                         to_hex          endp


                         ;
                         ; do_timestamp  Print a CR in the current window, and then the current
                         ;               time in the form hh:mm if timestamp mode is enabled.
                         ;               Destroys ax.

                         do_timestamp    proc    near
B0 0D                                    mov     al,cr                   ;start with cr
E8 0D92 R                                call    w_print
2E: F6 06 002C R 01                      test    timestamp,1
                                         $ifmot  z
51                                         push  cx
52                                         push  dx
B4 00                                      mov   ah,timer_read           ;get time of day in ticks (18.2/s)
CD 1A                                      int   timer_int               ;in cx:dx
8A C1                                      mov   al,cl                   ;cl=hh because 65536/18.2 = 3600
E8 0D9A R                                  call  w_print_dd              ;print as hh
B0 3A                                      mov   al,':'
E8 0D92 R                                  call  w_print                 ;print :
8B C2                                      mov   ax,dx                   ;get tick minutes in dx:ax
33 D2                                      xor   dx,dx
2E: F7 36 0CA0 R                           div   kw1092                  ;divide by 18.2*60 to get minutes
E8 0D9A R                                  call  w_print_dd              ;print al as mm
B0 20                                      mov   al,' '
E8 0D92 R                                  call  w_print                 ;print blank
5A                                         pop   dx
59                                         pop   cx
                                         $endif
C3                                       ret

                         do_timestamp    endp

                         ;
                         ; int_error     Print internal error message.
                         ;               Input: al=location code
```

```
                        ;                       bx,cx = data to print
                        ;               Destroys ax.
                        ;

49 6E 74 65 72 6E       int_error_msg   db      'Internal error ',0
61 6C 20 65 72 72
6F 72 20 00

                        int_error       proc    near
56                                      push    si
50                                      push    ax
8D 36 0DFA R                            lea     si,int_error_msg
                                        $do                             ;print error msg
2E: AC                                    lods  int_error_msg
3C 00                                     cmp   al,0
                                          $exitif z
E8 0D92 R                                 call  w_print
                                        $repeat
58                                      pop     ax
5E                                      pop     si
E8 0DAC R                               call    w_print_nn              ;print code in al
B0 20                                   mov     al," "
E8 0D92 R                               call    w_print
8A C7                                   mov     al,bh                   ;print bh
E8 0DAC R                               call    w_print_nn
8A C3                                   mov     al,bl                   ;print bl
E8 0DAC R                               call    w_print_nn
B0 20                                   mov     al," "
E8 0D92 R                               call    w_print
8A C5                                   mov     al,ch                   ;print ch
E8 0DAC R                               call    w_print_nn
8A C1                                   mov     al,cl                   ;print cl
E8 0DAC R                               call    w_print_nn
B0 0D                                   mov     al,cr
E8 0D92 R                               call    w_print
C3                                      ret
                        int_error       endp


                        ;
                        ; release_rbs   Release any rbs allocated.
                        ;               Restore the L4_debug flag.
                        ;

                        release_rbs     proc    near
2E: C5 3E 0C66 R                        lds     di,l4_publics           ;restore l4_debug
2E: A1 0C6A R                           mov     ax,our_l4_debug
89 45 06                                mov     ds:[di].l4_debug,ax
2E: C5 36 0C5E R                        lds     si,rcv_rb               ;release receiver's rb
E8 0E5D R                               call    release_an_rb
2E: C5 36 0C62 R                        lds     si,snd_rb               ;release sender's rb

8C D8                   release_an_rb:  mov     ax,ds
```

```
0B C0                                   or      ax,ax                   ;is it null?
                                        $ifnot  z
                                        14_call release_rb              ;no: release it
                                        $endif
C3                                      ret
                        release_rbs     endp
```

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                        ;-----------------------------------------------------------------------------
                        ;
                        ; DISPATCH      Dispatch the next task, in round-robin fashion.
                        ;               NO registers are destroyed during a task switch, except flags.
                        ;               CS and SS registers are assumed constant for all tasks.
                        ;
                        ;-----------------------------------------------------------------------------

                        dispatch        proc    near

                        ;       Deactivate current task

50                              push    ax                      ;save everything
53                              push    bx
51                              push    cx                      ;WARNING: init_task knows how
52                              push    dx                      ;  much we save!
55                              push    bp
56                              push    si
57                              push    di
1E                              push    ds
06                              push    es
2E: 8B 1E 000F R                mov     bx,curtask              ;get current task block pointer
2E: 89 A7 0007 R                mov     tcbs[bx],sp             ;save stack pointer there

83 C3 02                        add     bx,tcbsize              ;change to offset of next tcb
83 FB 08                        cmp     bx,ntasks*tcbsize
                                $if     ae
BB 0000                           mov   bx,0                    ;wraparound to task 0
                                $endif
2E: 89 1E 000F R                mov     curtask,bx

                        ;       Activate new task

2E: 8B 1E 000F R                mov     bx,curtask
2E: 8B A7 0007 R                mov     sp,tcbs[bx]             ;get stack pointer
07                              pop     es                      ;restore everything
1F                              pop     ds
5F                              pop     di
5E                              pop     si
5D                              pop     bp
5A                              pop     dx
59                              pop     cx
5B                              pop     bx
58                              pop     ax
C3                              ret                             ;resume that task

                        dispatch        endp
```

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                        ;-----------------------------------------------------------------------------
                        ;
                        ; dispatch_start       This is the keyboard/timer/l4_exit interrupt task,
                        ;                      and runs with the registers of the interrupt routine.
                        ;                      It's only function is to start and stop the
                        ;                      task dispatcher so that the other tasks run.
                        ;
                        ; No registers can be destroyed!  Also, use as little original stack as possible.
                        ;
                        ; The caller should already have ensured that L4 is not busy.
                        ;
                        ;-----------------------------------------------------------------------------

                        dispatch_start  proc    near
50                              push    ax              ;save the only reg we use

FA                              cli
2E: F6 06 001B R 01             test    tasks_active,1  ;last-chance recursion check
                        $if     z
2E: C6 06 001B R 01             mov     tasks_active,1  ;signal that tasks are active
2E: 8C 16 0011 R                mov     savss,ss        ;save caller's ss:sp
2E: 89 26 0013 R                mov     savsp,sp
8C C8                           mov     ax,cs           ;setup our own stack
8E D0                           mov     ss,ax
8D 26 0F00 R                    lea     sp,stack0       ;as task zero
2E: C7 06 000F R 0000           mov     curtask,0
=B                              sti

=8 0EF3 R                       call    busy_rb_check           ;check for other open connections

                                $do
=8 0E69 R                         call  dispatch                ;run other tasks until
2E: F6 06 0024 R 01               test  do_stop,1               ;told to stop
                                $repeatwhile z
2E: C6 06 0024 R 00             mov     do_stop,0

=A                              cli                     ;recover caller's stack
)0                              nop
2E: 8E 16 0011 R                mov     ss,cs:savss
2E: 8B 26 0013 R                mov     sp,cs:savsp
2E: C6 06 001B R 00             mov     tasks_active,0  ;tasks are not active

                        $endif                          ;recursion check
=B                              sti

)8                              pop     ax              ;restore reg
=3                              ret                     ;return to kb interrupt rtn

                        dispatch_start  endp
```

```
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                        ;-----------------------------------------------------------------------------
                        ;
                        ; busy_rb_check        Check if any rb's in the system have open connections.
                        ;                      Set the "other_conn_busy" flag accordingly.
                        ;                      Destroys no registers.
                        ;
                        ; This flag is used by the tasks to avoid time-consuming operations if
                        ; there are other processes in the machine that need to service the network
                        ; and might timeout otherwise, such as an open connection to the fileserver.
                        ;
                        ; The operations currently avoided when other connection are busy are:
                        ;
                        ;       1. Opening the windows to allow user interaction.
                        ;       2. Sending probe messages to verify rumors.
                        ;
                        ; Note that this technique will prevent the windows from ever being opened
                        ; if a long-duration connection is maintained, such as for ms/net!
                        ;
                        ;-----------------------------------------------------------------------------

                        busy_rb_check   proc    near
50                                      push    ax
1E                                      push    ds
56                                      push    si
2E: C6 06 0021 R 01                     mov     other_conn_busy,1       ;assume we will find someone
2E: C5 36 0C66 R                        lds     si,14_publics
C5 74 14                                lds     si,dword ptr ds:[si].active_head ;head of rb chain
                                        $do
8C D8                                     mov   ax,ds                   ;is ptr zero?
0B C0                                     or    ax,ax
                                          $exitif z                     ;yes: end of chain - no action
8A 44 08                                  mov   al,ds:[si].conn_status
3C 00                                     cmp   al,cn_established       ;check for open connection
74 0E                                     je    busy_rb_xit
3C 05                                     cmp   al,cn_accept_wait       ;or about-to-be-open connection
74 0A                                     je    busy_rb_xit
C5 34                                     lds   si,dword ptr ds:[si].next ;next rb in the chain
                                        $repeat
2E: C6 06 0021 R 00                     mov     other_conn_busy,0       ;nothing busy

5E                      busy_rb_xit:    pop     si
1F                                      pop     ds
58                                      pop     ax
C3                                      ret

                        busy_rb_check   endp
```

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                                page
                                %out    -----interrupt routines

                        ;-----------------------------------------------------------------------------
                        ;
                        ;  Keyboard read interrupt (int 16h) intercept routine.
                        ;
                        ;       Start the TALK task dispatcher if a message is incoming, or
                        ;       if the trigger character has been typed.
                        ;
                        ;       Enter with the keyboard interrupt request code in ah.
                        ;       This routine MUST MODIFY NO REGISTERS EXCEPT AX, and must
                        ;       use as little stack as possible.
                        ;
                        ;       This routine guards against recursion, and won't do anything if the
                        ;       tasks dispatcher is already running, or if L4 is busy.
                        ;
                        ;       This supports the extended function code "key_talk", which returns
                        ;       NOT key_talk in AH to indicate we are present, and status bits
                        ;       in AL to indicate whether the window are open on the screen.
                        ;       This is used by NWCMDS to know whether to open its window.
                        ;
                        ;       This also supports the extended function code "key_talk_send"
                        ;       to send messages to another station's TALK window.
                        ;
                        ;-----------------------------------------------------------------------------

                        key_int_rtn     proc    far
FA                                      cli                     ;insure disable if called by other trap

80 FC 63                                cmp     ah,key_talk             ;special nestar extended function
                                        $if     e                       ;  for "talk info"?
E9 102A R                                 jmp   do_key_talk             ;yes: do it whether active or not
                                        $endif

80 FC 60                                cmp     ah,key_talk_stop        ;special nestar extended function
                                        $if     e                       ; for "talk suspend"?
E9 106E R                                 jmp   do_key_talk_stop        ;yes: do it whether active or not
                                        $endif

80 FC 5F                                cmp     ah,key_talk_start       ;special nestar extended function
                                        $if     e                       ; for "talk resume"?
E9 1078 R                                 jmp   do_key_talk_start       ;yes: do it whether active or not
                                        $endif


2E: F6 06 001B R 01                     test    tasks_active,1          ;tasks running?
75 1F                                   jnz     kb_int_next             ;yes: don't do anything

2E: F6 06 0028 R 01                     test    suspended,1             ;have we been stopped?
75 17                                   jnz     kb_int_next             ;yes: don't do anything
```

```
2E: F6 06 0020 R 01                     test    kb_int_busy,1           ;recursion test
75 0F                                   jnz     kb_int_next             ; (actually unnecessary)

1E                                      push    ds
56                                      push    si
2E: C5 36 0C66 R                        lds     si,14_publics           ;get ptr to 14 publics
F6 44 08 01                             test    ds:[si].14_in_use,1     ;is 14 busy?
5E                                      pop     si
1F                                      pop     ds
                                        $ifnot  z
2E: FF 2E 0C75 R            kb_int_next:  jmp   old_key_vector          ;to to next kb routine
                                        $endif


                            ;       Do one-time-only dispatch to initialize all tasks and allow
                            ;       the broadcast message to be sent by the send_task.

2E: F6 06 0025 R 01                     test    first_dispatch,1;has it been done?
                                        $ifnot  z                       ;no
E8 0EF3 R                               call    busy_rb_check           ;check for busy fileserver connection
2E: F6 06 0021 R 01                     test    other_conn_busy,1       ; (avoids 30 second retry delay!)
75 E8                                   jnz     kb_int_next             ;busy: can't initialize now
2E: C6 06 0025 R 00                     mov     first_dispatch,0;clear the flag
E8 0EA0 R                               call    dispatch_start          ;and do it
                                        $endif


                            ;       Do a dispatch if a request to open the windows is queued,
                            ;       or if there is an incoming message.

E: F6 06 0023 R 01                      test    do_open,1
                                        $ifnot  z
8 0EA0 R                                  call  dispatch_start
                                        $endif

E: F6 06 0026 R 01                      test    open_recvd,1
                                        $ifnot  z
8 0EA0 R                                  call  dispatch_start
                                        $endif


                            ;       Determine keyboard interrupt request type

0 FC 00                                 cmp     ah,key_read             ;read character request?
4 0D                                    je      do_key_read
0 FC 01                                 cmp     ah,key_stat             ;read status request?
4 40                                    je      do_key_stat
0 FC 61                                 cmp     ah,key_talk_send;nestar extended cmd to send_msg?
5 BA                                    jne     kb_int_next             ;no: pass it on
9 103D R                                jmp     do_key_send

                            ;       read key

C                           do_key_read:  pushf                         ;get the character requested
```

```
B4 00                                   mov     ah,key_read             ;
FA                                      cli                             ;   (enter him disabled)
2E: FF 1E 0C75 R                        call    old_key_vector          ;   from the next kb routine
2E: 3A 06 005D R                        cmp     al,keychar              ;our trigger character?
75 6B                                     jne   key_int_exit            ;no: exit to caller
0A C0                                   or      al,al                   ;check for extended scan code
                                        $if     z
2E: 3A 26 005E R                          cmp   ah,keychar_scan
75 60                                     jne   key_int_exit
                                        $endif
2E: C6 06 0023 R 01                     mov     do_open,1               ;open windows
2E: C6 06 0029 R 00                     mov     popped_up,0
2E: C6 06 0020 R 01                     mov     kb_int_busy,1
E8 0EA0 R                               call    dispatch_start          ;and process until closed
2E: C6 06 0020 R 00                     mov     kb_int_busy,0
EB C8                                   jmp     short do_key_read       ;then read another key for caller

                        ;       read status

9C                      do_key_stat:    pushf                           ;get status
B4 01                                   mov     ah,key_stat             ;
FA                                      cli                             ;   (enter him disabled)
2E: FF 1E 0C75 R                        call    old_key_vector          ;   from the next kb routine
74 38                                     jz    key_int_exit            ;no key: exit with Z set
2E: 3A 06 005D R                        cmp     al,keychar              ;our trigger character?
75 31                                     jne   key_int_exit            ;no: exit with NZ set
0A C0                                   or      al,al                   ;check for extended scan code
                                        $if     z
2E: 3A 26 005E R                          cmp   ah,keychar_scan
75 26                                     jne   key_int_exit            ;no: exit with NZ set
                                        $endif
B4 00                                   mov     ah,key_read             ;consume the key
9C                                      pushf
FA                                      cli                             ; (enter him disabled)
2E: FF 1E 0C75 R                        call    old_key_vector
2E: C6 06 0023 R 01                     mov     do_open,1               ;open windows
2E: C6 06 0029 R 00                     mov     popped_up,0
2E: C6 06 0020 R 01                     mov     kb_int_busy,1
E8 0EA0 R                               call    dispatch_start          ;and process until closed
2E: C6 06 0020 R 00                     mov     kb_int_busy,0
EB BD                                   jmp     short do_key_stat       ;then read status again for caller

CA 0002                 key_int_exit:   ret     2                       ;return to caller; return new flags


                        ;
                        ;               Nestar extended int 16h functions
                        ;


                        ;
                        ;       Return TALK extended info
```

```
                        ;
                        ;       ah=key_talk
                        ;       return ah=not key_talk, status bits ("key_ext_xxx") in al

)4 9C                   do_key_talk:    mov     ah,not key_talk         ;return complemented fct code
:E: F6 06 0022 R 01                     test    windows_open,1          ; to indicate we are present
                                        $if     z
)0 02                                     mov   al,key_ext_idle         ;windows not on screen
                                        $else
)0 01                                     mov   al,key_ext_active       ;windows are on screen
                                        $endif
B EA                                    jmp     short key_int_exit


                        ;
                        ;       Send a TALK message.
                        ;
                        ;       ah=key_talk_send;  al=stn addr, ds:si=message ending with CR
                        ;       return ah=not key_talk_send; al=status

E: A2 005B R            do_key_send:    mov     send_msg_stn,al         ;save stn addr
E: 89 36 0057 R                         mov     word ptr send_msg_ptr,si;save message ptr
E: 8C 1E 0059 R                         mov     word ptr send_msg_ptr+2,ds
E: C6 06 005C R 00                      mov     send_msg_stat,0         ;clear status
E: C6 06 0027 R 01                      mov     send_msg_rqst,1         ;turn on request
E: C6 06 0020 R 01                      mov     kb_int_busy,1
8 0EA0 R                                call    dispatch_start          ;start tasks to process
E: C6 06 0020 R 00                      mov     kb_int_busy,0
4 9E                                    mov     ah,not key_talk_send    ;return complemented fct code
E: A0 005C R                            mov     al,send_msg_stat;and send status
B B9                                    jmp     short key_int_exit

                        ;
                        ;       Suspend TALK.
                        ;
                        ;       ah=key_talk_stop;  al=0 (reserved for future use)
                        ;       Return ah=not key_talk_stop

                        do_key_talk_stop:
E: C6 06 0028 R 01                      mov     suspended,1             ;(pbs if active now?)
4 9F                                    mov     ah,not key_talk_stop    ;return complemented fct code
3 AF                                    jmp     short key_int_exit


                        ;
                        ;       Resume TALK.
                        ;
                        ;       ah=key_talk_start;  al=0 (reserved for future use)
                        ;       Return ah=not key_talk_start

                        do_key_talk_start:
E: C6 06 0028 R 00                      mov     suspended,0             ;unsuspend
4 A0                                    mov     ah,not key_talk_start   ;return complemented fct code
4 A5                                    jmp     short key_int_exit
```

```
Key_int_rtn     endp
```

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                        page
                ;-----------------------------------------------------------------------
                ;
                ;       Check for incoming messages if we haven't checked for a while.
                ;       If a message is arriving, startup the task dispatcher to process it.
                ;
                ;       This is called from interrupt routines, so should conserve stack space.
                ;       Destroys ax and flags.
                ;
                ;-----------------------------------------------------------------------

                check_incoming  proc    near
2E: F6 06 0026 R 01                     test    open_recvd,1            ;is msg incoming already?
                    $if z                                               ;yes: don't bother to check L4
51                                      push    cx
52                                      push    dx
B4 00                                   mov     ah,timer_read           ;get current time
CD 1A                                   int     timer_int               ;
8A C2                                   mov     al,dl                   ;low byte of time
2E: 2A 06 0C5B R                        sub     al,last_open_rcv;now-then (even if wraparound!)
3C 03                                   cmp     al,how_often            ;long enough ago?
5A                                      pop     dx                      ;
59                                      pop     cx

                    $if     ae                                          ;was long enough ago
2E: 88 16 0C5B R                        mov     last_open_rcv,dl;save time now

1E                                      push    ds
56                                      push    si
2E: C5 36 0C66 R                        lds     si,l4_publics           ;get ptr to l4 publics
F6 44 08 01                             test    ds:[si].l4_in_use,1     ;is l4 busy?
                                $if z                                   ;no: can check
FA                                      cli
2E: 8C 16 0011 R                        mov     savss,ss                ;save caller's ss:sp
2E: 89 26 0013 R                        mov     savsp,sp
8C C8                                   mov     ax,cs                   ;setup our own stack
8E D0                                   mov     ss,ax
8D 26 0F00 R                            lea     sp,stack0               ;borrow task 0's
FB                                      sti
2E: C5 36 0C5E R                        lds     si,rcv_rb               ;get ptr to rb
2E: A1 0C5C R                           mov     ax,wks
89 44 30                                mov     [si].hdr_src_socket,ax  ;listen socket
                                        l4_call open_recv
                                        $if     c                       ;message is coming in
2E: C6 06 0026 R 01                       mov   open_recvd,1            ;  flag to that effect
                                        $endif
FA                                      cli                             ;recover caller's stack
90                                      nop
2E: 8E 16 0011 R                        mov     ss,cs:savss
2E: 8B 26 0013 R                        mov     sp,cs:savsp
FB                                      sti
                                $endif                                  ;l4 busy check
1F                                      pop     si
```

```
F                                       pop     ds

                                $endif                                  ;long-ago check

                              $endif                                    ;already incoming check


E: F6 06 0026 R 01                      test    open_recvd,1            ;is a msg incoming?
                                        $ifnot  z                       ;yes,
E                                         push  ds
6                                         push  si
E: C5 36 0C66 R                           lds   si,l4_publics           ;get ptr to l4 publics
6 44 08 01                                test  ds:[si].l4_in_use,1     ;is l4 busy?
E                                         pop   si
F                                         pop   ds
                                          $if   z
8 0EA0 R                                   call dispatch_start          ;no: start the tasks
                                          $endif                        ;l4 busy check
                                        $endif


3                                       ret
                        check_incoming  endp
```

```
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                        ;-----------------------------------------------------------------------
                        ;
                        ;       L4 exit "interrupt" routine
                        ;
                        ;       This is called by the transport level network routines after the
                        ;       l4_in_use flag has been cleared.  We use it as a way to get
                        ;       "asynchronous" control at a time when it is safe to call L4.
                        ;
                        ;
                        ;-----------------------------------------------------------------------

                        l4_exit_rtn     proc    far
C                                       pushf                           ;save flags, ax
D                                       push    ax
A                                       cli
E: A0 001F R                            mov     al,l4_exit_busy         ;recursion and busy checks
E: 0A 06 001B R                         or      al,tasks_active
E: 0A 06 001E R                         or      al,timer_int_busy
E: 0A 06 0020 R                         or      al,kb_int_busy
E: 0A 06 0028 R                         or      al,suspended
                                        $if     z
E: C6 06 001F R 01                        mov   l4_exit_busy,1
3 1082 R                                  call  check_incoming          ;check for incoming messages
E: C6 06 001F R 00                        mov   l4_exit_busy,0
                                        $endif
3                                       pop     ax
)                                       popf                            ;restore flags, ax
3                                       sti
E: FF 2E 0C6C R                         jmp     old_l4_exit             ;chain to previous l4 exit rtn
                        l4_exit_rtn     endp
```

```
                        page

                ;-----------------------------------------------------------------------
                ;
                ;
                ;               Timer interrupt routine
                ;
                ;
                ;       1. Handle noise (tweedle) generation.
                ;       2. Count ticks
                ;       3. Check for incoming messages
                ;
                ; We used to hang off the software timer vector (int 1ch), but that doesn't
                ; work because the interrupt controller had not yet been reset, causing the
                ; clock not to run, which causes L4 to hang waiting for packets to time out.
                ; We now hang off the hardware interrupt and execute the existing timer
                ; interrupt routine to completion before starting any network activity.
                ; The recursion flag prevents subsequent clock ticks from causing problems.
                ; Note that the recursion flag is set late so tweedles can be processed even
                ; while the tasks are running after having been started by this interrupt rtn.
                ;
                ;-----------------------------------------------------------------------

                timer_int_rtn   proc    far
9C                              pushf                           ;push flags to simulate hw int
2E: FF 1E 0C79 R                call    old_time_vec            ;execute the hw interrupt rtn
50                              push    ax                      ;save regs
53                              push    bx

2E: FF 06 0C7D R                inc     ticks                   ;count ticks

                ;       Do tweedling

2E: 8B 1E 0C7F R                mov     bx,tweedle_ptr          ;get ptr to sound array
83 FB 00                        cmp     bx,0
                        $ifnot  e                               ;if sound in progress,
2E: 8A 27                       mov     ah,cs:[bx]              ;get sound array value
0A E4                           or      ah,ah

                                $ifnot  e                       ;more sounds to make
B0 A6                           mov     al,timer_ctrl_msb       ;setup to load msb
E6 43                           out     timer_ctrl,al
8A C4                           mov     al,ah                   ;load msb from array value
E6 42                           out     timer_ch2,al
E4 61                           in      al,kb_ctrl
0C 03                           or      al,kb_ctrl_spkr         ;enable speaker
E6 61                           out     kb_ctrl,al
43                              inc     bx                      ;increment ptr to array
2E: 89 1E 0C7F R                mov     tweedle_ptr,bx

                                $else                           ;stop the sounds
E4 61                           in      al,kb_ctrl
24 FC                           and     al,255-kb_ctrl_spkr     ;turn off the speaker
E6 61                           out     kb_ctrl,al
```

```
2E: C7 06 0C7F R 0000                   mov     tweedle_ptr,0           ;zero ptr to sound array
                                        $endif

                                $endif                                  ;sound in progress


                        ;       Do incoming message check, if things are otherwise quiescent.
                        ;       (Only the keyboard interrupt is allowed to be active.)

2E: A0 001E R                           mov     al,timer_int_busy       ;recursion check
2E: 0A 06 001B R                        or      al,tasks_active         ;other activity checks
2E: 0A 06 001F R                        or      al,14_exit_busy
2E: 0A 06 0028 R                        or      al,suspended
                                        $if     z
2E: C6 06 001E R 01                       mov   timer_int_busy,1;flag timer interrupt busy
E8 1082 R                                 call  check_incoming          ;check for incoming messages
2E: C6 06 001E R 00                       mov   timer_int_busy,0;clear timer interrupt busy flag
                                        $endif                          ;recursion check

5B                                      pop     bx                      ;restore regs
58                                      pop     ax
CF                                      iret                            ;return from interrupt
                        timer_int_rtn   endp
```

```
                                page


                        ;
                        ;       talk_exit:      Shutdown everything
                        ;
                        talk_exit       proc    near

                        ;       Remove the timer tick interrupt routine

A                               cli
E 0000                          mov     si,0            ;point es:si at interrupt vector
E C6                            mov     es,si
E 0020                          mov     si,timer_tick*4
E: A1 0C79 R                    mov     ax,word ptr old_time_vec ;bx:ax is old pointer
E: 8B 1E 0C7B R                 mov     bx,word ptr old_time_vec+2
6: 89 04                        mov     es:[si],ax
6: 89 5C 02                     mov     es:[si+2],bx
B                               sti

                        ;       Remove the keyboard interrupt routine

E 0058                          mov     si,key_int*4
E: A1 0C75 R                    mov     ax,word ptr old_key_vector
E: 8B 1E 0C77 R                 mov     bx,word ptr old_key_vector+2
6: 89 04                        mov     es:[si],ax
6: 89 5C 02                     mov     es:[si+2],bx

                        ;       Release network resources

E: A1 0C5C R                    mov     ax,wks                  ;cancel the listen
                                14_call ignore
8 0E44 R                        call    release_rbs             ;release the rbs

3                               ret
                        talk_exit       endp

                        cseg            ends
                                        end
```

Name	Length
. . . . . .000E	
. 0001	
. 0001	
. 0001	
. 0002	
. 0002	
. 0006	
. 0008	
T 0008	
. 0009	
. 0004	
. 0001	
. 0001	
. 0006	
. 0006	
. 0001	
. 0001	
. 0001	
. 0001	
. 0007	
OP. 0007	
TIL 0007	
ILE 0007	
. 0003	
. 0002	

s and records:

Name	Width / Shift	# fields Width	Mask	Initial
DER 002E	0015			
E	0000			
. . . . .	0001			
NUM	0002			
T	0003			
M	0004			
H	0006			
TRL	0008			
TYPE.	0009			
TWORK	000A			
ST.	000E			
CKET.	0014			
WORK.	0016			
T	001A			
KET	0020			
RL.	0022			
PE.	0023			
ID.	0024			
. . . . .	0026			
. . . . .	0028			

```
                                 002A
UM. . . . . .                   002C
. . . . . .0003                  0002
EL. . . . . .                    0000
E . . . . . .                    0001
. . . . . .0006                  0001
UBS . . . . . .004B              001D
ION . . . . . .                  0000
URES. . . . . .                  0002
US. . . . . .                    0004
. . . . . .                      0005
G . . . . . .                    0006
SE. . . . . .                    0008
T_MODE. . . . . .                0009
ER. . . . . .                    000A
AD. . . . . .                    0010
HEAD. . . . . .                  0014
CEPT_WAIT . . . . . .            0018
TRIES . . . . . .                001A
K_WAIT. . . . . .                001C
GE_TRIES. . . . . .              001E
T_WAIT. . . . . .                0020
KEEP. . . . . .                  0022
AIT . . . . . .                  0024
KIO_VECTOR. . . . . .            0026
ECTOR . . . . . .                002A
IT_VECTOR . . . . . .            002E
. . . . . .                      0032
RE1 . . . . . .                  0034
RE2 . . . . . .                  0036
RE3 . . . . . .                  0038
RE4 . . . . . .                  003A
T_VECTOR. . . . . .              003C
ST. . . . . .                    0040
. . . . . .                      0046
FROM_NET. . . . . .              004A
. . . . . .0086                  0043
. . . . . .                      0000
. . . . . .                      0004
_MODE. . . . . .                 0006
SE. . . . . .                    0007
TUS. . . . . .                   0008
TUS. . . . . .                   0009
. . . . . .                      000A
IGTH. . . . . .                  000E
_CODE . . . . . .                0010
AGE. . . . . .                   0011
ET_NUM . . . . . .               0012
MENT . . . . . .                 0013
KSUM . . . . . .                 0014
NGTH . . . . . .                 0016
S_CTRL . . . . . .               0018
ET_TYPE. . . . . .               0019
_NETWORK . . . . . .             001A
```

```
EST_HOST. . . . . .  001E
EST_SOCKET. . . . . .  0024
RC_NETWORK. . . . . .  0026
RC_HOST . . . . . .  002A
RC_SOCKET . . . . . .  0030
ONN_CTRL. . . . . .  0032
ATA_TYPE. . . . . .  0033
URCE_ID. . . . . .  0034
EST_ID. . . . . .  0036
EQ_NUM. . . . . .  0038
CK_NUM. . . . . .  003A
LOC_NUM. . . . . .  003C
TATUS. . . . . .  003E
YPE. . . . . .  003F
TR . . . . . .  0040
IMIT . . . . . .  0044
ENGTH. . . . . .  0046
ACCEPT_WAIT. . . . . .  0048
N_TRIES. . . . . .  004A
ACK_WAIT . . . . . .  004C
SAGE_TRIES . . . . . .  004E
PKT_WAIT . . . . . .  0050
ALID . . . . . .  0052
YPE. . . . . .  0053
C. . . . . .  0054
ST . . . . . .  0055
RE1. . . . . .  0056
RE2. . . . . .  0058
RE3. . . . . .  005A
RE4. . . . . .  005C
TATE . . . . . .  005E
TATE . . . . . .  005F
HANGED . . . . . .  0060
URSOR. . . . . .  0062
EMAINING . . . . . .  0066
K_REQ. . . . . .  0068
Q_VALID. . . . . .  006A
TATE . . . . . .  006B
HANGED . . . . . .  006C
URSOR. . . . . .  006E
Q. . . . . .  0072
K. . . . . .  0074
LOC. . . . . .  0076
JF . . . . . .  0078
OR . . . . . .  007A
TART . . . . . .  007E
ETRIES . . . . . .  0080
TART_SEQ . . . . . .  0082
AGS. . . . . .  0084
. . . . . .  0085
. . . . . .0007  0005
OR . . . . . .  0000
AGS. . . . . .  0001
OUPMASK. . . . . .  0002
```

```
EL. . . . . .  0004
E . . . . . .  0005
REC . . . . . .000A  0005
PT_WAIT . . . . . .  0000
IES . . . . . .  0002
WAIT. . . . . .  0004
_TRIES. . . . . .  0006
WAIT. . . . . .  0008
```

and Groups:

N a m e	Size	Align	Combine	Class
. . . . . .GROUP				
. . . . .	0000	PARA	COMMON	'HSEGCL'
. . . . .	3953	PARA	COMMON	'VSEGCL'
. . . . .	11DD	PARA	PUBLIC	'CODE'
NT. 100E	PARA	NONE		

N a m e	Type	Value	Attr
. . . . . .Number	FFFF		
. . . . . .N PROC	0038	CSEG	Global Length =0027
. . . . . .Alias	C_TRUE		
)WN . . . . . .L BYTE	002D	VSEG	
) . . . . . .L BYTE	002B	VSEG	
. . . . . .Number	0002		
. . . . . .Number	0004		
. . . . . .Number	0003		
. . . . . .Number	0004		
. . . . . .Number	0007		
. . . . . .L NEAR	008C	CSEG	
:NET. . . . . .L BYTE	0C58	VSEG	
. . . . . .Number	0008		
) . . . . . .L NEAR	009C	CSEG	
.E. . . . . .N PROC	0091	CSEG	Length =0024
IECK. . . . . .N PROC	0EF3	CSEG	Length =0030
T. . . . . .L NEAR	0F1F	CSEG	
. . . . . .L BYTE	0030	VSEG	
. . . . . .L BYTE	0033	VSEG	
.INE. . . . . .L BYTE	0035	VSEG	
. . . . . .L BYTE	0034	VSEG	
.L. . . . . .L BYTE	0032	VSEG	
MING . . . . . .N PROC	1082	CSEG	Length =0084
IANGES. . . . . .N PROC	06BE	CSEG	Length =003F
_XIT . . . . . .L NEAR	06FC	CSEG	
. . . . . .Number	0004		
. . . . . .Number	0008		
. . . . . .Number	0001		
. . . . . .Number	0002		
WAIT . . . . . .Number	0005		
SHED . . . . . .Number	0000		

```
. . . . . .Number  0002
ONN. . . . . .Number  0001
RCVD . . . . . .Number  0006
ERROR. . . . . .Number  0004
_ERROR . . . . . .Number  0003
 . . . . . .L BYTE  0031  VSEG
T. . . . . .L NEAR  0C11  CSEG
TS . . . . . .N PROC  0B36  CSEG  Length =0038
 . . . . . .Number  000D
 . . . . . .L WORD  000F  VSEG
 . . . . . .Number  0000
 . . . . . .Number  FFFF
 . . . . . .L BYTE  0C4F  VSEG
 . . . . . .L BYTE  0C50  VSEG
 . . . . . .Number  0013
 . . . . . .N PROC  0E69  CSEG  Length =0037
_START . . . . . .N PROC  0EA0  CSEG  Length =0053
KIT. . . . . .Number  004C
KITSTAY. . . . . .Number  0031
RINTC. . . . . .Number  0002
RINTS. . . . . .Number  0009
 . . . . . .Number  0021
 . . . . . .L NEAR  034B  CSEG
EAD. . . . . .L NEAR  0FAC  CSEG
END. . . . . .L NEAR  103D  CSEG
TAT. . . . . .L NEAR  0FE4  CSEG
ALK. . . . . .L NEAR  102A  CSEG
ALK_START. . . . . .L NEAR  1078  CSEG
ALK_STOP . . . . . .L NEAR  106E  CSEG
 . . . . . .L BYTE  0023  VSEG
P. . . . . .L NEAR  02BA  CSEG
 . . . . . .L BYTE  0024  VSEG
TAMP . . . . . .N PROC  0DC9  CSEG  Length =0031
TOM_ROW. . . . . .L BYTE  0048  VSEG
T_COL. . . . . .L BYTE  0045  VSEG
ERRIGHT. . . . . .L WORD  0047  VSEG
HT_COL . . . . . .L BYTE  0047  VSEG
_ROW . . . . . .L BYTE  0046  VSEG
ERLEFT . . . . . .L WORD  0045  VSEG
 . . . . . .Number  0011
 . . . . . .Number  001B
 . . . . . .Number  0000
P. . . . . .L NEAR  0062  CSEG
 . . . . . .N PROC  005F  CSEG  Length =0032
EXIT. . . . . .L NEAR  0090  CSEG
PATCH . . . . . .L BYTE  0025  VSEG
IZE . . . . . .Number  0014
TYPE. . . . . .Number  0099
REC . . . . . .N PROC  0B6E  CSEG  Length =003B
AR. . . . . .L NEAR  015D  CSEG
IG. . . . . .Number  6272
 . . . . . .L NEAR  030B  CSEG
S . . . . . .L WORD  069C  CSEG
GE. . . . . .N PROC  0CF7  CSEG  Length =009B
```

```
FIXSTN . . . . . .L NEAR  0D6C    CSEG
OW . . . . . .L BYTE  160F    VSEG
 . . . . . .L BYTE  0B70    VSEG
 . . . . . .L BYTE  0B71    VSEG
IZE. . . . . .L WORD  0B6E    VSEG
 MAP . . . . . .L BYTE  0C3E    VSEG    Length =0011
IZE. . . . . .Number  0001
E. . . . . .Number  00BB
M_ROW. . . . . .L BYTE  0040    VSEG
COL. . . . . .L BYTE  003D    VSEG
RIGHT. . . . . .L WORD  003F    VSEG
_COL . . . . . .L BYTE  003F    VSEG
OW . . . . . .L BYTE  003E    VSEG
LEFT . . . . . .L WORD  003D    VSEG
 . . . . . .Number  0003
 . . . . . .L WORD  1000    NIC_SEGMENT
 . . . . . .L NEAR  00B5    CSEG
 . . . . . .L NEAR  0207    CSEG
 . . . . . .L NEAR  0243    CSEG
 . . . . . .L NEAR  0240    CSEG
 . . . . . .L NEAR  022B    CSEG
 . . . . . .L NEAR  0220    CSEG
 . . . . . .L NEAR  0238    CSEG
 . . . . . .L NEAR  0279    CSEG
 . . . . . .L NEAR  0276    CSEG
 . . . . . .L NEAR  0264    CSEG
 . . . . . .L NEAR  0259    CSEG
 . . . . . .L NEAR  026E    CSEG
 . . . . . .L NEAR  0290    CSEG
 . . . . . .L NEAR  0290    CSEG
 . . . . . .L NEAR  028D    CSEG
 . . . . . .L NEAR  00D6    CSEG
 . . . . . .L NEAR  02B3    CSEG
 . . . . . .L NEAR  02B0    CSEG
 . . . . . .L NEAR  02A5    CSEG
 . . . . . .L NEAR  02D0    CSEG
 . . . . . .L NEAR  02D9    CSEG
 . . . . . .L NEAR  02E2    CSEG
 . . . . . .L NEAR  02EB    CSEG
 . . . . . .L NEAR  02F2    CSEG
 . . . . . .L NEAR  0308    CSEG
 . . . . . .L NEAR  0307    CSEG
 . . . . . .L NEAR  0348    CSEG
 . . . . . .L NEAR  00D6    CSEG
 . . . . . .L NEAR  033E    CSEG
 . . . . . .L NEAR  0351    CSEG
 . . . . . .L NEAR  0356    CSEG
 . . . . . .L NEAR  03A2    CSEG
 . . . . . .L NEAR  03B4    CSEG
 . . . . . .L NEAR  03CB    CSEG
 . . . . . .L NEAR  03D2    CSEG
 . . . . . .L NEAR  03E6    CSEG
 . . . . . .L NEAR  042D    CSEG
 . . . . . .L NEAR  03FF    CSEG
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```
. . . . . .L NEAR  0418    CSEG
. . . . . .L NEAR  00EF    CSEG
. . . . . .L NEAR  0418    CSEG
. . . . . .L NEAR  0418    CSEG
. . . . . .L NEAR  0450    CSEG
. . . . . .L NEAR  044B    CSEG
. . . . . .L NEAR  0467    CSEG
. . . . . .L NEAR  046E    CSEG
. . . . . .L NEAR  0482    CSEG
. . . . . .L NEAR  0500    CSEG
. . . . . .L NEAR  049D    CSEG
. . . . . .L NEAR  04C4    CSEG
. . . . . .L NEAR  04AD    CSEG
. . . . . .L NEAR  04C4    CSEG
. . . . . .L NEAR  04C4    CSEG
. . . . . .L NEAR  0119    CSEG
. . . . . .L NEAR  04DE    CSEG
. . . . . .L NEAR  04E1    CSEG
. . . . . .L NEAR  04F1    CSEG
. . . . . .L NEAR  0513    CSEG
. . . . . .L NEAR  0520    CSEG
. . . . . .L NEAR  053A    CSEG
. . . . . .L NEAR  052A    CSEG
. . . . . .L NEAR  0557    CSEG
. . . . . .L NEAR  0557    CSEG
. . . . . .L NEAR  0146    CSEG
. . . . . .L NEAR  0562    CSEG
. . . . . .L NEAR  0598    CSEG
. . . . . .L NEAR  034B    CSEG
. . . . . .L NEAR  0596    CSEG
. . . . . .L NEAR  0573    CSEG
. . . . . .L NEAR  0596    CSEG
. . . . . .L NEAR  057D    CSEG
. . . . . .L NEAR  0596    CSEG
. . . . . .L NEAR  0587    CSEG
. . . . . .L NEAR  059B    CSEG
. . . . . .L NEAR  05FA    CSEG
. . . . . .L NEAR  05AE    CSEG
. . . . . .L NEAR  05C7    CSEG
. . . . . .L NEAR  05EC    CSEG
. . . . . .L NEAR  05E8    CSEG
. . . . . .L NEAR  05FE    CSEG
. . . . . .L NEAR  060C    CSEG
. . . . . .L NEAR  060E    CSEG
. . . . . .L NEAR  0616    CSEG
. . . . . .L NEAR  015D    CSEG
. . . . . .L NEAR  061D    CSEG
. . . . . .L NEAR  0635    CSEG
. . . . . .L NEAR  0631    CSEG
. . . . . .L NEAR  068B    CSEG
. . . . . .L NEAR  0676    CSEG
. . . . . .L NEAR  0673    CSEG
. . . . . .L NEAR  065D    CSEG
. . . . . .L NEAR  0670    CSEG
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. . . . . .L NEAR  068B    CSEG
. . . . . .L NEAR  0685    CSEG
. . . . . .L NEAR  06CE    CSEG
. . . . . .L NEAR  06D7    CSEG
. . . . . .L NEAR  06F9    CSEG
. . . . . .L NEAR  06F7    CSEG
. . . . . .L NEAR  016F    CSEG
. . . . . .L NEAR  0766    CSEG
. . . . . .L NEAR  072C    CSEG
. . . . . .L NEAR  0710    CSEG
. . . . . .L NEAR  072C    CSEG
. . . . . .L NEAR  0728    CSEG
. . . . . .L NEAR  0740    CSEG
. . . . . .L NEAR  0758    CSEG
. . . . . .L NEAR  0756    CSEG
. . . . . .L NEAR  076E    CSEG
. . . . . .L NEAR  0796    CSEG
. . . . . .L NEAR  07A2    CSEG
. . . . . .L NEAR  07AF    CSEG
. . . . . .L NEAR  07D3    CSEG
. . . . . .L NEAR  07C0    CSEG
. . . . . .L NEAR  00B5    CSEG
. . . . . .L NEAR  07D8    CSEG
. . . . . .L NEAR  018A    CSEG
. . . . . .L NEAR  07F9    CSEG
. . . . . .L NEAR  082A    CSEG
. . . . . .L NEAR  0827    CSEG
. . . . . .L NEAR  0832    CSEG
. . . . . .L NEAR  084A    CSEG
. . . . . .L NEAR  0868    CSEG
. . . . . .L NEAR  0868    CSEG
. . . . . .L NEAR  088C    CSEG
. . . . . .L NEAR  08AD    CSEG
. . . . . .L NEAR  08C3    CSEG
. . . . . .L NEAR  08C3    CSEG
. . . . . .L NEAR  08F3    CSEG
. . . . . .L NEAR  018A    CSEG
. . . . . .L NEAR  090D    CSEG
. . . . . .L NEAR  0937    CSEG
. . . . . .L NEAR  097E    CSEG
. . . . . .L NEAR  0955    CSEG
. . . . . .L NEAR  0979    CSEG
. . . . . .L NEAR  0992    CSEG
. . . . . .L NEAR  0992    CSEG
. . . . . .L NEAR  09AC    CSEG
. . . . . .L NEAR  09C2    CSEG
. . . . . .L NEAR  09CB    CSEG
. . . . . .L NEAR  018A    CSEG
. . . . . .L NEAR  0A03    CSEG
. . . . . .L NEAR  0A12    CSEG
. . . . . .L NEAR  0A21    CSEG
. . . . . .L NEAR  0A74    CSEG
. . . . . .L NEAR  0A52    CSEG
. . . . . .L NEAR  0A4F    CSEG
```

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. . . . . .L NEAR  0A69    CSEG
. . . . . .L NEAR  0A83    CSEG
. . . . . .L NEAR  0ABB    CSEG
. . . . . .L NEAR  0A9F    CSEG
. . . . . .L NEAR  0AB5    CSEG
. . . . . .L NEAR  0AB3    CSEG
. . . . . .L NEAR  01B5    CSEG
. . . . . .L NEAR  0AD7    CSEG
. . . . . .L NEAR  0ADF    CSEG
. . . . . .L NEAR  0B26    CSEG
. . . . . .L NEAR  0B0E    CSEG
. . . . . .L NEAR  0B0B    CSEG
. . . . . .L NEAR  0B50    CSEG
. . . . . .L NEAR  0B6A    CSEG
. . . . . .L NEAR  0B68    CSEG
. . . . . .L NEAR  0B66    CSEG
. . . . . .L NEAR  0BA8    CSEG
. . . . . .L NEAR  0B93    CSEG
. . . . . .L NEAR  0B7D    CSEG
. . . . . .L NEAR  0B8D    CSEG
. . . . . .L NEAR  0B97    CSEG
. . . . . .L NEAR  0BA6    CSEG
. . . . . .L NEAR  0BFB    CSEG
. . . . . .L NEAR  0BEA    CSEG
. . . . . .L NEAR  01B3    CSEG
. . . . . .L NEAR  0C35    CSEG
. . . . . .L NEAR  0C52    CSEG
. . . . . .L NEAR  0C51    CSEG
. . . . . .L NEAR  0C6C    CSEG
. . . . . .L NEAR  0CBD    CSEG
. . . . . .L NEAR  0CAC    CSEG
. . . . . .L NEAR  0CCD    CSEG
. . . . . .L NEAR  0D04    CSEG
. . . . . .L NEAR  0D14    CSEG
. . . . . .L NEAR  0D1B    CSEG
. . . . . .L NEAR  0D66    CSEG
. . . . . .L NEAR  0D64    CSEG
. . . . . .L NEAR  0D5E    CSEG
. . . . . .L NEAR  01A8    CSEG
. . . . . .L NEAR  0D57    CSEG
. . . . . .L NEAR  01B2    CSEG
. . . . . .L NEAR  0D72    CSEG
. . . . . .L NEAR  0D8F    CSEG
. . . . . .L NEAR  0DC6    CSEG
. . . . . .L NEAR  0DF9    CSEG
. . . . . .L NEAR  0E10    CSEG
. . . . . .L NEAR  0E1B    CSEG
. . . . . .L NEAR  0E68    CSEG
. . . . . .L NEAR  0E87    CSEG
. . . . . .L NEAR  0EF0    CSEG
. . . . . .L NEAR  0ECD    CSEG
. . . . . .L NEAR  0F04    CSEG
. . . . . .L NEAR  0F19    CSEG
. . . . . .L NEAR  0F2C    CSEG
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. . . . . .L NEAR  01CF    CSEG
. . . . . .L NEAR  0F34    CSEG
. . . . . .L NEAR  0F3C    CSEG
. . . . . .L NEAR  0F68    CSEG
. . . . . .L NEAR  0F84    CSEG
. . . . . .L NEAR  0F8F    CSEG
. . . . . .L NEAR  0F9A    CSEG
. . . . . .L NEAR  0FC7    CSEG
. . . . . .L NEAR  1001    CSEG
. . . . . .L NEAR  103B    CSEG
. . . . . .L NEAR  1039    CSEG
. . . . . .L NEAR  01C7    CSEG
. . . . . .L NEAR  10EB    CSEG
. . . . . .L NEAR  01CC    CSEG
. . . . . .L NEAR  10EB    CSEG
. . . . . .L NEAR  10E9    CSEG
. . . . . .L NEAR  10DC    CSEG
. . . . . .L NEAR  1105    CSEG
. . . . . .L NEAR  1105    CSEG
. . . . . .L NEAR  1132    CSEG
. . . . . .L NEAR  117C    CSEG
. . . . . .L NEAR  117C    CSEG
. . . . . .L NEAR  116F    CSEG
. . . . . .L NEAR  11A0    CSEG
. . . . . .L NEAR  01DF    CSEG
. . . . . .L NEAR  01F5    CSEG
. . . . . .Number  0000
. . . . . .Number  22F6
. . . . . .Number  22F8
. . . . . .Number  22F6
. . . . . .Number  22C4
. . . . . .Number  2198
. . . . . .Number  21CA
. . . . . .Number  0258
. . . . . .Number  0002
. . . . . .Number  0002
. . . . . .Number  0003
. . . . . .Number  0002
. . . . . .Number  0002
. . . . . .Number  0002
. . . . . .Number  FFFF
. . . . . .N PROC  0E0A    CSEG    Length =003A
MSG. . . . . .L BYTE  0DFA    CSEG
N. . . . . .L BYTE  0C51    VSEG
. . . . . .L BYTE  1003    NIC_SEGMENT     Length =0003
. . . . . .L BYTE  0C9F    VSEG
_TYPE. . . . . .Number  0094
. . . . . .L BYTE  005F    VSEG    Length =008F
_FULL. . . . . .L BYTE  0054    VSEG
_PREV. . . . . .L BYTE  00EE    VSEG    Length =008F
E. . . . . .Number  008F
FPTR . . . . . .L WORD  0905    VSEG
FSIZ . . . . . .L WORD  0903    VSEG
NS . . . . . .L BYTE  0907    VSEG
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_END. . . . . .Number  0082
_HEAD . . . . . .Number  001A
_START. . . . . .Number  0080
_TAIL . . . . . .Number  001C
. . . . . .Number  0061
PKR . . . . . .Number  0003
. . . . . .L BYTE  0055    VSEG
SV. . . . . .L BYTE  0020    VSEG
XT. . . . . .L NEAR  0F63    CSEG
. . . . . .N PROC  00B5    CSEG    Global  Length =0047
. . . . . .L BYTE  005D    VSEG
CAN . . . . . .L BYTE  005E    VSEG
. . . . . .Number  5300
. . . . . .Number  5000
. . . . . .Number  4F00
CTIVE . . . . . .Number  0001
DLE . . . . . .Number  0002
. . . . . .Number  3B00
. . . . . .Number  3D00
. . . . . .Number  4700
. . . . . .Number  5200
. . . . . .Number  0016
KIT . . . . . .L NEAR  1027    CSEG
TN. . . . . .F PROC  0F23    CSEG    Global  Length =015F
. . . . . .Number  4B00
S . . . . . .Number  0062
. . . . . .Number  5100
. . . . . .Number  4900
. . . . . .Number  0000
. . . . . .Number  4D00
. . . . . .Number  0002
. . . . . .Number  0001
. . . . . .Number  0063
SEND. . . . . .Number  0061
START . . . . . .Number  005F
STOP. . . . . .Number  0060
. . . . . .Number  4800
. . . . . .L WORD  0CA0    VSEG
. . . . . .L DWORD 0000    CSEG    Global  Length =000E
ISV . . . . . .L BYTE  001F    VSEG
TN. . . . . .F PROC  1106    CSEG    Global  Length =0034
ED . . . . . .L NEAR  005B    CSEG
_SEG. . . . . .Number  0000
. . . . . .L NEAR  0049    CSEG
T. . . . . .L NEAR  005E    CSEG
. . . . . .Number  0000
. . . . . .L DWORD 0C66    VSEG
RCV. . . . . .L BYTE  0C5B    VSEG
. . . . . .Number  000A
. . . . . .L BYTE  0911    VSEG
_TYPE. . . . . .Number  0097
TYPE . . . . . .Number  0098
. . . . . .Alias   OFF_L4GET_PTRS
. . . . . .Number  0010
```

```
T . . . . . .Number  00C8
E . . . . . .Number  0010
T . . . . . .Number  0258
. . . . . .L NEAR  0081    CSEG
. . . . . .L BYTE  0000    NIC_SEGMENT     Length =1000
. . . . . .Number  0000
. . . . . .L NEAR  031E    CSEG
. . . . . .L NEAR  01E3    CSEG
. . . . . .Number  0005
. . . . . .Number  0001
. . . . . .Number  0004
. . . . . .Number  0003
ONN . . . . . .Number  0009
. . . . . .Number  0006
E_RB. . . . . .Number  0001
. . . . . .Number  0007
. . . . . .Number  0008
. . . . . .Number  0004
. . . . . .Number  000C
TRS . . . . . .Number  000D
. . . . . .Number  0000
. . . . . .Number  0003
CV. . . . . .Number  0005
G . . . . . .Number  000B
_RB . . . . . .Number  0002
G . . . . . .Number  000A
TOR . . . . . .L DWORD 0C75    VSEG
. . . . . .L DWORD 0C6C    VSEG
C . . . . . .L DWORD 0C79    VSEG
. . . . . .Number  0012
. . . . . .Number  0000
. . . . . .L BYTE  0026    VSEG
BUSY. . . . . .L BYTE  0021    VSEG
. . . . . .L BYTE  0C59    VSEG
G . . . . . .L WORD  0C6A    VSEG
E . . . . . .L WORD  002E    VSEG
. . . . . .L BYTE  0029    VSEG
. . . . . .L NEAR  0B1B    CSEG
S . . . . . .N PROC  0AC1    CSEG    Length =0075
_MSG. . . . . .N PROC  0599    CSEG    Length =0075
. . . . . .N PROC  00FC    CSEG    Length =028C
RET . . . . . .L NEAR  0387    CSEG
. . . . . .N PROC  055E    CSEG    Length =003B
_Z. . . . . .L NEAR  0598    CSEG
_MSG. . . . . .N PROC  060E    CSEG    Length =00B0
_MSG. . . . . .N PROC  06FD    CSEG    Length =006A
D . . . . . .L NEAR  0697    CSEG
D . . . . . .L NEAR  05EE    CSEG
. . . . . .L WORD  0C73    VSEG
. . . . . .Number  002C
. . . . . .L NEAR  07EB    CSEG
. . . . . .L BYTE  0C56    VSEG
. . . . . .L BYTE  017D    VSEG    Length =03C3
. . . . . .Number  03C3
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N. . . . . .L NEAR  082D    CSEG
 . . . . . .L NEAR  0892    CSEG
PE . . . . . .L BYTE  0C5A    VSEG
 . . . . . .L DWORD 0C5E    VSEG
 . . . . . .N PROC  0508    CSEG    Global  Length =0056
AIN. . . . . .L NEAR  07F0    CSEG
 . . . . . .L BYTE  001D    VSEG
GE . . . . . .N PROC  0767    CSEG    Length =0164
 . . . . . .L NEAR  076E    CSEG
_RB. . . . . .L NEAR  0E5D    CSEG
S. . . . . .N PROC  0E44    CSEG    Global  Length =0025
 . . . . . .Number  0002
 . . . . . .L WORD  1006    NIC_SEGMENT     Length =0003
S. . . . . .L WORD  100C    NIC_SEGMENT
 . . . . . .L BYTE  1002    NIC_SEGMENT
_TYPE. . . . . .Number  0096
 . . . . . .Number  0080
T. . . . . .L BYTE  0915    VSEG
 . . . . . .L WORD  0013    VSEG
 . . . . . .L WORD  0011    VSEG
YPE. . . . . .Number  0095
N. . . . . .Number  0601
N. . . . . .Number  0604
N. . . . . .Number  0603
N. . . . . .Number  0602
 . . . . . .L NEAR  0C48    CSEG
 . . . . . .L BYTE  001C    VSEG
 . . . . . .L NEAR  0A17    CSEG
G. . . . . .N PROC  0995    CSEG    Length =012C
GE . . . . . .N PROC  0BA9    CSEG    Length =00BF
TR . . . . . .L DWORD 0057    VSEG
QST. . . . . .L BYTE  0027    VSEG
TAT. . . . . .L BYTE  005C    VSEG
TN . . . . . .L BYTE  005B    VSEG
 . . . . . .L NEAR  0A69    CSEG
UNT. . . . . .L BYTE  0C53    VSEG
UNT. . . . . .L BYTE  0C52    VSEG
N. . . . . .L NEAR  084B    CSEG
P. . . . . .L NEAR  0872    CSEG
 . . . . . .N PROC  08CB    CSEG    Global  Length =00CA
S. . . . . .Alias   C_TRUE
ONS. . . . . .N PROC  0397    CSEG    Length =0171
OLD. . . . . .L NEAR  04B6    CSEG
RPMSG. . . . . .L BYTE  0388    CSEG
RPMSGL . . . . . .Number  0008
EXT. . . . . .L NEAR  04FE    CSEG
TNS. . . . . .L NEAR  042D    CSEG
SRMSG. . . . . .L BYTE  0390    CSEG
SRMSGL . . . . . .Number  0007
 . . . . . .L NEAR  0500    CSEG
 . . . . . .L BYTE  0C57    VSEG
 . . . . . .L BYTE  0540    VSEG    Length =03C3
_SIZE. . . . . .L WORD  0908    VSEG
_TXT . . . . . .L WORD  090A    VSEG
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E. . . . . .Number  03C3
 . . . . . .L DWORD 0C62    VSEG
E. . . . . .Number  0003
OUND . . . . . .Number  0001
 . . . . . .Number  0000
 . . . . . .L WORD  0F00    VSEG
 . . . . . .L WORD  1158    VSEG
 . . . . . .L WORD  13B0    VSEG
 . . . . . .L WORD  1608    VSEG
 . . . . . .N PROC  0C84    CSEG    Length =003C
 . . . . . .L BYTE  0914    VSEG
 . . . . . .L NEAR  0C81    CSEG
 . . . . . .L BYTE  0916    VSEG    Length =0258
IZE. . . . . .L WORD  0912    VSEG
 . . . . . .N PROC  0C68    CSEG    Length =001C
JND. . . . . .L NEAR  0C83    CSEG
IZE. . . . . .Number  0005
 . . . . . .N PROC  0CC0    CSEG    Length =0037
E. . . . . .Number  00AA
 . . . . . .L BYTE  0028    VSEG
W_ROW. . . . . .L BYTE  0044    VSEG
COL. . . . . .L BYTE  0041    VSEG
RIGHT. . . . . .L WORD  0043    VSEG
_COL . . . . . .L BYTE  0043    VSEG
OW . . . . . .L BYTE  0042    VSEG
LEFT . . . . . .L WORD  0041    VSEG
 . . . . . .N PROC  11A3    CSEG    Global  Length =003A
 . . . . . .Number  0D04
 . . . . . .L WORD  0007    VSEG
 . . . . . .L WORD  0009    VSEG
 . . . . . .L WORD  000B    VSEG
 . . . . . .L WORD  000D    VSEG
VE . . . . . .L BYTE  001B    VSEG
 . . . . . .L WORD  0007    VSEG
 . . . . . .Number  0002
 . . . . . .L BYTE  002A    VSEG
T. . . . . .Number  0006
 . . . . . .Number  0002
 . . . . . .Number  0000
 . . . . . .Number  0005
N. . . . . .Number  0001
L. . . . . .Number  0008
ROR. . . . . .Number  0004
FL . . . . . .Number  0007
RROR . . . . . .Number  0003
 . . . . . .L WORD  0C7D    VSEG
 . . . . . .Number  0006
 . . . . . .Number  0042
 . . . . . .Number  0043
_MSB . . . . . .Number  00A6
 . . . . . .Number  001A
BUSY . . . . . .L BYTE  001E    VSEG
RTN. . . . . .F PROC  113A    CSEG    Global  Length =0069
 . . . . . .Number  0000
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. . . . . .Number  0008
. . . . . .L BYTE  002C    VSEG
CKS . . . . . .Number  0002
. . . . . .N PROC  0DBE    CSEG    Global  Length =000B
. . . . . .Number  0001
. . . . . .L BYTE  0C81    VSEG
. . . . . .L BYTE  0C85    VSEG
. . . . . .L BYTE  0C89    VSEG
. . . . . .L BYTE  0C8B    VSEG
. . . . . .L BYTE  0C8F    VSEG
. . . . . .L BYTE  0C92    VSEG
. . . . . .L WORD  0C7F    VSEG
_ROW. . . . . .L BYTE  004C    VSEG
OL. . . . . .L BYTE  0049    VSEG
IGHT. . . . . .L WORD  004B    VSEG
COL . . . . . .L BYTE  004B    VSEG
W . . . . . .L BYTE  004A    VSEG
EFT . . . . . .L WORD  0049    VSEG
. . . . . .Number  00CC
RSOR. . . . . .Number  0003
. . . . . .Number  0010
L . . . . . .Number  0006
RSOR. . . . . .Number  0002
_CH . . . . . .Number  000A
_TTY. . . . . .Number  000E
. . . . . .L NEAR  0000    External
N . . . . . .L BYTE  0022    VSEG
ERS . . . . . .L BYTE  160F    VSEG
E . . . . . .Number  0002
NE. . . . . .Number  0000
URS . . . . . .Number  0004
. . . . . .Number  0007
. . . . . .Number  0001
OP. . . . . .Number  0009
T . . . . . .Number  0003
CT. . . . . .Number  0006
TTR . . . . . .Number  0008
URS . . . . . .Number  0005
. . . . . .L WORD  0C5C    VSEG
. . . . . .N PROC  0D92    CSEG    Length =0008
. . . . . .N PROC  0D9A    CSEG    Length =0012
BLE . . . . . .L NEAR  0DB9    CSEG
. . . . . .N PROC  0DAC    CSEG    Length =0012
. . . . . .Number  0003
. . . . . .Number  0002
. . . . . .Number  0000
. . . . . .Number  0005
. . . . . .Number  0001
. . . . . .Number  0004
. . . . . .L NEAR  014B    CSEG
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0000                    ORG     0000H
0000 3E00               MVI     A,00H
0002 D3E0               OUT     0E0H
0004 3E01               MVI     A,01H
0006 D3E1               OUT     0E1H
0008 3E02               MVI     A,02H
000A D3E2               OUT     0E2H
000C 3E03               MVI     A,03H
000E D3E3               OUT     0E3H
0010 3E04               MVI     A,04H
0012 D3E4               OUT     0E4H
0014 3E05               MVI     A,05H
0016 D3E5               OUT     0E5H
0018 3E06               MVI     A,06H
001A D3E6               OUT     0E6H
001C 3E07               MVI     A,07H
001E D3E7               OUT     0E7H
0020 3E08               MVI     A,08H
0022 D3E8               OUT     0E8H
0024 3E09               MVI     A,09H
0026 D3E9               OUT     0E9H
0028 3E0A               MVI     A,0AH
002A D3EA               OUT     0EAH
002C 3E0B               MVI     A,0BH
002E D3EB               OUT     0EBH
0030 3E0C               MVI     A,0CH
0032 D3EC               OUT     0ECH
0034 3E0D               MVI     A,0DH
0036 D3ED               OUT     0EDH
0038 3E0E               MVI     A,0EH
003A D3EE               OUT     0EEH
003C 3E0F               MVI     A,0FH
003E D3EF               OUT     0EFH
0040 3E10               MVI     A,10H
0042 D3F0               OUT     0F0H
0044 3E11               MVI     A,11H
0046 D3F1               OUT     0F1H
0048 3E12               MVI     A,12H
004A D3F2               OUT     0F2H
004C 3E13               MVI     A,13H
004E D3F3               OUT     0F3H
0050 3E14               MVI     A,14H
0052 D3F4               OUT     0F4H
0054 3E15               MVI     A,15H
0056 D3F5               OUT     0F5H
0058 3E16               MVI     A,16H
005A D3F6               OUT     0F6H
005C 3E17               MVI     A,17H
005E D3F7               OUT     0F7H
0060 3E18               MVI     A,18H
0062 D3F8               OUT     0F8H
0064 3E19               MVI     A,19H
0066 D3F9               OUT     0F9H
0068 3E1A               MVI     A,1AH
006A D3FA               OUT     0FAH
006C 3E1B               MVI     A,1BH
006E D3FB               OUT     0FBH
0070 3E1C               MVI     A,1CH
0072 D3FC               OUT     0FCH
0074 3E1D               MVI     A,1DH
0076 D3FD               OUT     0FDH
0078 3E1E               MVI     A,1EH
007A D3FE               OUT     0FEH
007C 3E1F               MVI     A,1FH
007E D3FF               OUT     0FFH
0080 C30000             JMP     0000H
                        END
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