```
09/16/93   CPU 3090  SER nnnnn  GDDM Graphic History Display    Perf. Monitor

                        X total CPU     Cl1 85% time
     500 %CPU                           - - - - - - -
       .8 Sec.
     250 %CPU
       .4 Sec.
        0
          07:43     08:01      08:30      09:01      09:31      10:00

                    Source data:  Memory

    F6=Save  F9=Print  F12=Return              File Name: FCONMON   Copies 1
```

# VM/ESA Full Screen Operator Console and Graphical Real Time Performance Monitor

### Version 3.1.00

Program Number 5788-LGA

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**1**

This edition prepared September 1997

# Product Overview

The 'VM/ESA **F**ull Screen Operator **CON**sole and Graphical Real Time Performance Monitor', hereafter referred to as 'FCON/ESA', is a CMS module designed to assist operators and systems programmers or analysts in the following areas:

- **System console operation in full screen mode.** The features provided have been designed to facilitate operating on VM/XA SP and VM/ESA (ESA feature) systems, thereby improving operator efficiency and productivity.

- **Performance monitoring.** An enhanced real time performance monitor allows systems programmers to monitor system performance and to analyze bottlenecks. New features included in the monitor, and the manner in which data are displayed, have been designed to improve the systems programmer's productivity when analyzing the system, and to allow even a more casual user to work efficiently with the tool. Threshold monitoring allows alert messages to be generated for the system operator so that corrective action can be taken at an early stage.

  The program can help the systems programmer to make more efficient use of system resources, to increase system productivity and to improve end-user satisfaction.

# System Console Operation in Full Screen Mode

The new features are:

- general system output (info messages and replies to commands entered) can automatically be scrolled, using an enhanced scrolling logic

- messages from other virtual machines are numbered and left pending at the top of the screen until explicitly deleted, even if automatic scrolling is active

- special handling of messages generated by the VMTAPE program product (5664-292) with automatic deletion of superseded and obsolete messages

- the last few important 'action' messages (number can be specified) can also be left pending at the top of the screen until explicitly deleted

- optionally, additional processing of output lines which meet certain user specifications. Selected lines can be

  - suppressed (not displayed, written to log only)
  - displayed with different color and highlighting and/or made non-scrollable
  - modified before display (e.g. long RSCS header information removed) to make the text more easily readable
  - re-routed to other machines on the same system and they can
  - cause EXEC procedures to be executed and so help automating system operation.

- extended highlighting and color support

- a redisplay facility allows browsing through the day's accumulated console log, or through previous days' logs

The following figure is an example of the screen layout when using FCON/ESA for system console operation:

```
08/10/90      VM/ESA Full Screen Op. Console / Perf. Monitor      Autoscroll 10
*31 10:25:44 MSG FROM USER1  : Please attach my tape 'SAMP02' as 181
+32 10:29:10 FCXPER315A % total CPU 372 exceeds limit 360 (USER10   53.2 %CPU)
   10:38:47 DCDS1616  RECONNECT MAINT    USERS = 365
   10:39:51 FCNS7421  LOGON   AS USER2   USERS = 366
   10:39:55 I1UTVF20  RECONNECT USER3    USERS = 366
   10:39:59 FCNSB206  LOGOFF  AS USER4   USERS = 365
   ICH408I USER(VSE03  ) GROUP(VSEGRP ) NAME(SMITH J.          )
     LOGON/JOB INITIATION - INVALID PASSWORD
   10:40:29 ABJ794    LOGON   AS USER5   USERS = 366
   10:41:02 FCNSH607  LOGON   AS USER6   USERS = 367
   10:42:31 q ta free
   10:42:31 TAPE 098B FREE
   10:42:47 DCDS1616  LOGOFF  AS MAINT   USERS = 366
   10:42:53 DCDSY508  LOGOFF  AS USER7   USERS = 365




   Command ===> _
    F1=Help  F2=Redisplay  F3=Quit  F12=Return
```

Note that the numbered Message from USER1 and the 'action'-message indicating a high CPU load were only scrolled up to the top of the screen. They will remain there until explicitly deleted by the operator.

# Real time performance monitoring

FCON/ESA continuously displays the current system load, even while in basic system operation mode. In a virtual machine with additional CP privilege classes and access to the *MONITOR system service additional functions are available:

- automatic exception and threshold monitoring of many key performance indicators, with operator notification if user defined limits are exceeded.

- special performance monitoring mode with displays for monitoring

  - overall system performance, incl. LPAR
  - storage utilization and management for system and users
  - I/O load and performance (channel, I/O device and cache data)
  - detailed I/O device performance, including information on the I/O load caused by specific minidisks on a real disk pack. This feature effectively allows an on-line SEEKs analysis.
  - user performance (resource consumption, paging, wait states, transactions etc.)
  - performance of Shared File System servers
  - detailed user performance, including status and load of virtual devices
  - detailed 'by time' displays for many system performance indicators.

The collected performance data are further used to provide

- a re-display facility for many of the key figures shown on the general CPU performance screen which allows browsing through the last measurements (up to twelve hours)
- graphical history plots with a selection of up to four re-display variables, either as simple plots, or, if the Graphical Data Display Manager program (5684-007 or 5684-168) is available on the system, also in the form of GDDM graphics (see example on front cover)
- graphical variable correlation plots (simple plots or GDDM graphics), which show how the values of specific variables are correlated to the values of another variable

- optional creation of performance history files on disk. History data on disk can be viewed by the redisplay facility, or used as input for the creation of trend graphics (capacity planning)

- performance data can also be printed for later reference.

Performance data can be collected even while working in another console mode. The screen will typically be used in basic mode most of the time, it can be switched to operate in monitoring mode when a performance problem is suspected.

## Examples:
The following figure is an example of the output shown on the *detailed device screen* when a disk has been selected for display:

```
09/08/93    CPU 3090  SER nnnnn  Interval 15:29:58 - 15:30:13    Perf. Monitor

Detailed Analysis for Device 084D ( SYSTEM )
Device type : 3390-3     Function pend.:    .3ms    Device busy  :   40%
VOLSER      : VMV003     Disconnected  :  12.2ms    I/O contention:   0%
Nr. of LINKs:   1194     Connected     :   3.9ms    Reserved     :    0%
Last SEEK   :   1038     Service time  :  16.4ms    SENSE SSCH   :    0
SSCH rate/s :   23.8     Response time :  16.4ms    Recovery SSCH :    0
Status: MDCACHE USED


Path(s) to device 084D:   14    20    54    60
Channel path status  :    ON    ON    ON    ON


Device            Overall CU-Cache Performance        Split
DIR ADDR VOLSER    IO/S %READ %RDHIT %WRHIT ICL/S BYP/S  IO/S %READ %RDHIT
05  084D VMV003    21.3   85    56      0     .0    .0   'NORMAL' I/O only

  MDISK Extent    Userid   Addr IO/s VSEEK Status   LINK  VIO/s %MDC MDIO/s
+---------------------------------------------------------------------------+
C 1063 - 1462    CDIRLIB1 0193  .0     0 WR                                C
C                JPE      0101 12.6    0 RR                                C
C                CWIR     0101 9.8     0 RR                                C
C                WRU      0107 9.6     0 RR                                C
C                VC       0103 5.7     0 RR      1123  53.1  100    .0 C
C 1463 - 1562    SQ3PSBS  0234  .0     0 WR         1    .0  ...    .0 C
C 1563 - 1582    ECAUTHOR 0291  .0     0 WR                                C
C                ECFINAL  0291  .2     0 RR         5    .2  100    .0 C
C 1583 - 1592    TOOLS    0504  .0     0 WR         1    .0  ...    .0 C
C 1660 - 1739    CHCAL    05FE 3.6     0 WR         1   3.6    0   3.6 C
C .... - ........                                                    .0 C
+---------------------------------------------------------------------------+


Command ===> _
F1=Help  F4=Top  F5=Bot  F7=Bkwd  F8=Fwd  F12=Return
```

It shows the location and the I/O load of minidisks belonging to logged-on users, and also the contribution of specific users to the total I/O rate of a certain minidisk. This display allows to easily track a performance problem on a disk to the minidisk(s) and user(s) who caused it, and then to correct the problem.

The *detailed user screen* is another example of the new features available with the FCON performance monitor:

```
08/23/93    CPU 3090  SER nnnnn  Interval 08:27:14 - 08:28:15    Perf. Monitor

Detailed data for user SQL3   (sec. user: SQLMSTR )
Total CPU  :  5.8%    Storage def. : 49.152kB   Page fault rate:   .0/s
Superv. CPU:  1.2%    Resident pgs :  1.696kB   Page read rate :   .0/s
Emulat. CPU:  4.6%    Proj. WSET   :  1.576kB   Page write rate:   .0/s
VF total   : ....%    Reserved pgs :     0kB    SPOOL pg reads :   .0/s
VF overhead: ....%    Locked pages :     0kB    SPOOL pg writes:   .0/s
VF emulation: ....%   XSTORE dedic.:     0kB    Main > XSTORE  :   .0/s
VF load rate: ..../s  XSTORE pages :   136kB    XSTORE > main  :   .0/s
I/O rate  :  19.8/s   DASD slots   :   975      XSTORE > DASD  :   .0/s
UR I/O rate :  .0/s   IUCV X-fer/s :  54.2/s    MDC insert rate:   .0/s

#I/O active :   0     Active  : 12%    PSW wait : 70%    I/O act. :  0%
Stacked blk :  ..     Page wait : 0%   CF wait  : 0%     Eligible :  0%
Stat.: ESA,DSC,DORM   I/O wait : 0%    Sim. wait: 0%     Runnable : 30%

Data Space Name        Size Mode  RD/s WR/s XRD/s XWR/s Mig/s Stl/s Xlat/s
BASE                    48M Priv   .0   .0   .0    .0    .0    .0    .0

Device activity and status:
0009 3215  .0                          000C 254R     CL *, EOF    NOH NCNT
000D 254P    CL A, CO 01, NOH NCNT     000E 1403     CL A, CO 01, NOH NCNT
0190 3380  .0 0729,RR, 112CYL,--->0    0191 3380  .0 0618,WR,   5CYL,--->0
0193 3380  .0 0728,RR,  80CYL,--->0    0195 3380  .0 072B,RR,  20CYL,--->0
019D 3380  .0 061C,RR,  80CYL,--->0    019E 3390  .0 0847,RR,  44CYL,--->0
0200 3380  .1 0618,WR,  40CYL,--->0    0201 3380  .0 0618,WR,  15CYL,--->0
.... ....                              .... ....
0223 3390  .1 084D,WR,100% MDC eff.    0231 3390 2.4 084D,WR,  52% MDC eff.
0232 3390 3.1 084E,WR, 58% MDC eff.    0233 3390 1.2 084D,WR,  61% MDC eff.
0234 3390 2.4 084E,WR, 57% MDC eff.


Command ===> _
F1=Help  F4=Top  F5=Bot  F7=Bkwd  F8=Fwd  F12=Return
```
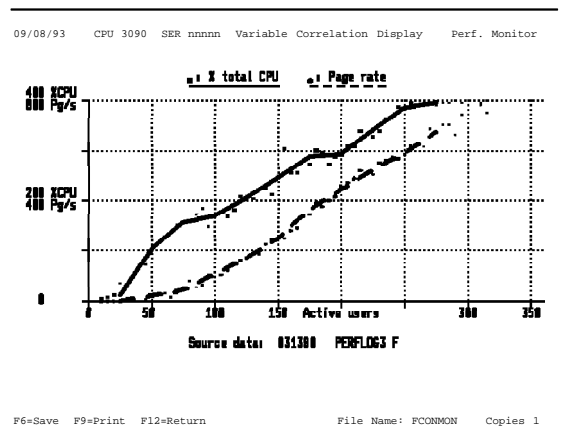
This display shows, in addition to the overall performance indicators for the virtual machine, some detailed information on the status and I/O load of the virtual devices used by the machine. It can help, for instance, to determine the reason for I/O performance problems of a specific virtual machine by locating the virtual and real I/O devices which are currently used. Further analysis of the real devices will then show the reason for the unsatisfactory I/O performance.

The *variable correlation display* is an example for the use of GDDM graphics:



```
09/08/93    CPU 3090  SER nnnnn  Variable Correlation Display    Perf. Monitor
```

F6=Save  F9=Print  F12=Return          File Name: FCONMON   Copies 1

It allows you to show graphically how any of the performance variables from the redisplay screen are correlated to each other (here total CPU load and page rate to the number of active users), and this can help to determine the area in the system where a general bottleneck is suspected.

**Remote Performance Monitoring Facility:**

A remote performance monitoring facility is part of the program. It is intended to allow

- efficient central performance monitoring for many remote systems, by displaying CPU load and any exceptions found on a single screen in a central monitor machine
- concurrent multiple access to the central monitor machine's data
- performance data retrieval from local and remote FCON/ESA) monitoring machines, and display of the data in a manner very similar to native performance monitoring mode in the respective monitoring machine.

The following is an example of the initial system overview display of the remote performance monitoring facility:

```
05/08/91       FCON(/ESA) Remote Perf. Monitoring Facility    Remote Data

Sel Node-ID   Time  ------------ Exceptions & CPU Load ------------> AvExcp
 _  EHNIVM0A  15:12 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> :    .00
 _  WALTERVM  15:12 >>>>>>>>>>>>>>>>>>>>=====                    :    .04
 _  BREUVM    15:12 %SPSL>>>>>>>>>>>>>>>>>>=====                 :    .08
 _  DUFAVM1   15:12 >>>>>>>>>>>>>>                               :      0
 _  EHNIVM01  15:12 Cache-Sub>>>>>>>>>>>>>>>>>>>>               :   1.05
 _  STUTVM1   15:12 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>       :    .35
 _  SDFVM003  15:12 Usrlimit>>>>>>>>>>>>>>>>>>>>>>>>>>           :    .44
 _  CHVM1     15:12 CP-Read>>>>>>>>>>>>>>>>>>>>>>>>>>>>          :   1.74
 _  VIEVMA    15:12 ClES,_Usrlimit>>>>>>>>>>>>>>>>>>>>>>>>       :   3.52
 _  GERMAZ01  15:12 Usrlimit>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>    :    .40
 _  GERMAZ06  15:12 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>            :    .47
 _  BOEVM3    15:12 >>>>>>>>>>>>>>>>>>>>>>>==========            :    .14
 _  SDFVM2    15:12 WSS-Loop>>>>>>>>>>>>>>>>>>>>>>               :    .56
 _  HERVM1    15:12 >>>>>>>>>>>>>>>>>>>>>>>>>>                   :    .00
 _  BOEVMN    03:50 Not updated for  683 min.                   :    ...
 _  STUTVM4   15:12 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>        :    .89
 _  GERMAZ05  15:12 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> :    .53

Select  a: add entry  d: delete  e: exception log  h: history data  m: monitor
Command ===> _
F1=Help  F4=Top  F5=Bot  F7=Bkwd  F8=Fwd  F12=Return
```

The performance data retrieval and display function will usually be invoked when the central monitoring facility has indicated exceptions which need closer investigation.

The facility is based on data transfer from remote systems via RSCS links and APPC/VM. It can handle performance data from FCON/ESA monitor programs on a large number of VM systems.

**Multiple Access to Performance Data**

VMCF and APPC/VM interfaces allow concurrent retrieval of performance data by different users, and an **Internet interface** allows data retrieval via TCP/IP and a standard Web Browser, from any of the platforms supported by the Web Browser.

**Differences to other VM performance measurement tools:**

VM Performance Reporting Facility (VMPRF, 5684-073): Although the FCON/ESA performance monitor shows similar information as VMPRF, can also produce log data on disk and provides facilities for analyzing log data in trend reports, one must remember that it has been designed primarily as a *real time* monitor. It cannot produce trend reports for *all* the variables available with VMPRF, nor can it reduce VM MONITOR data in batch mode. FCON/ESA cannot completely replace this product, but it can complement it by supplying the additional real time monitoring functions which are not part of VMPRF.

Realtime Monitor VM/ESA (RTM VM/ESA, 5798-DWD): The FCON/ESA performance monitor serves the same basic purpose as this product. Although not all of RTM's data screens have direct replacements in FCON/ESA, most of the information is available again in this program, and it also provides a lot of additional data and many features (e.g. detailed device and user information or performance graphics, remote performance monitoring facility, automatic loop detection, and all the screens based on *MONITOR data) not available with RTM VM/ESA. FCON/ESA can, therefore, replace this product on all systems.

# Online HELP Facility

HELP information available for online display includes a short description of the different operating modes, and full information (extracted from the 'Program Description and Operations Manual') on sub-commands, FCON/ESA messages, and field descriptions for all performance monitor displays.

# Planning Information

**Minimum system requirements**

*Hardware prerequisites:* FCON/ESA runs on any processor supported by VM/XA SP Release 2, or VM/ESA (ESA feature) Rel. 1.0 or higher.

- Supported terminals: FCON/ESA can be run on model 2A, 2C, 2, 3, 4 and 5 display terminals supported as VM/XA or VM/ESA logon consoles. Extended color and/or highlighting can be used when supported by the hardware.
  Graphic performance data displays can be shown only on terminals with graphics capability which are also supported by GDDM.
- Disk space requirements: A total of approx. 8 cylinders 3380, or the equivalent space on any other disk type supported by the CMS file system, are required for the FCON/ESA module, its initialization file, and the HELP files. Additional disk space is required on each user's A-disk for the log files created when the program is used for full screen operating, and for the optional performance history data files in machines where performance monitoring has been activated.
- One tape drive is required for installation.

*Software prerequisites*

```
VM/XA SP Rel. 2.1                       5664-308 or
VM/ESA (ESA feature) Rel.1 to 2.2    5684-112 or
VM/ESA Version 2.1 or 2.2              5654-030
Graphical Data Display Manager V.2.3  5684-007 [1]
 or "      "      "       "    V.3.1  5684-168 [1]
```

This program has been tested with Releases 1 and 2 of Version 2 of VM/ESA, and it should also run on all releases of Version 1 of VM/ESA (ESA feature). Later releases or versions of the basic VM systems may require new adapted levels of the program.

**Installation**

Installation of the program for initial basic use is very simple: a 'TAPE LOAD' of some files onto a CMS minidisk, and some minor adaptations of parameters in an initialization file. Some addi-

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[1] GDDM is a pre-requisite only for the special graphic displays of the performance monitor function. All data shown on these displays can also be viewed in other format if necessary.

tional customizing is recommended, however, for extracting the maximum benefit from the product.

### Program modifications
The program is designed to be used without modifications. Object code only is provided.

### Documentation
Customers will receive a detailed 'Program Description and Operations Manual'. This guide also contains a section with instructions for users with little experience in performance analysis on VM systems, and it explains how to use FCON/ESA for analyzing some common performance bottlenecks.

### Restrictions for full screen operation mode
FCON/ESA is a CMS module and its operation is based on the IUCV *MSG service (a standard component of VM/XA and VM/ESA), and on intercepting I/O, SVC and external interrupts. While all standard CP and CMS commands (except the 'programmable operator' PROP) will execute normally under FCON/ESA, the program imposes some restrictions on other CMS applications that are to be run under its control. These are documented in the manual.
Due to documented restrictions of the IUCV *MSG service

- CP messages, warnings and noheader messages will not be written to the CP console log, and
- noheader messages will be treated as normal messages.

### FCON/ESA Overhead
*System console operation in full screen mode* will cause only minimal overhead. The load imposed onto the system is negligible.

*Performance monitoring:* The load caused by automatic data collection for performance monitoring depends mainly on the I/O configuration, the number of users on the system, and on the monitor sample interval. It is typically well below .5% of total CPU.

## Sales Conditions

### Charges
Graduated one-time charges, in Swiss Francs, are [2][3]

| Processor | or LPAR Size | Charge |
|---|---|---|
| up to group 18 | up to 2 MIPS | CHF 10000.- |
| up to group 20 | up to 4 MIPS | CHF 13000.- |
| up to group 30 | up to 10 MIPS | CHF 20000.- |
| up to group 35 | up to 25 MIPS | CHF 24000.- |
| up to group 40 | up to 70 MIPS | CHF 28500.- |
| up to group 60 | up to 130 MIPS | CHF 37500.- |
| above group 60 | above 130 MIPS | CHF 45000.- |

A separate license is required for each designated machine, or each logical partition, on which the program will be used.

The testing period for this program is 30 days.

### Maintenance
The above prices are for the program 'as is'. IBM Switzerland (Informatica) will maintain the program at least up to the end of 2001, and will adapt it to future VM/ESA releases. However, the customer will *not* automatically receive all new maintenance levels and enhancements. When a new program level is requested, the supporting SE will retrieve the latest level, pass it on to the customer and print the matching documentation. There will be no additional maintenance fee up to the end of 2001 but the customer may be charged by local SE for the supply of refreshed copies of the program and its documentation. Conditions for further maintenance beyond the end of 2001 will be defined by mid 2001.

### Future Enhancements
IBM Switzerland (Informatica) intends to continue enhancing the program beyond its current capabilities. While many such enhancements may become available to existing customers without additional cost, prices may be adapted for new customers, and an upgrade charge asked from existing users, when new functions are added which basically extend the current scope of the program.

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[2] Base September 1997; prices are subject to change.

[3] Customers with licences for Version 2 of the program will pay upgrade charges only.

**Ordering / Demonstrations:** Contact your SE or marketing representative.

IBM SEs and marketing representatives can also contact the author directly for obtaining further information. Address queries to

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