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IBM 9037 Sysplex Timer and System/390 Time Management

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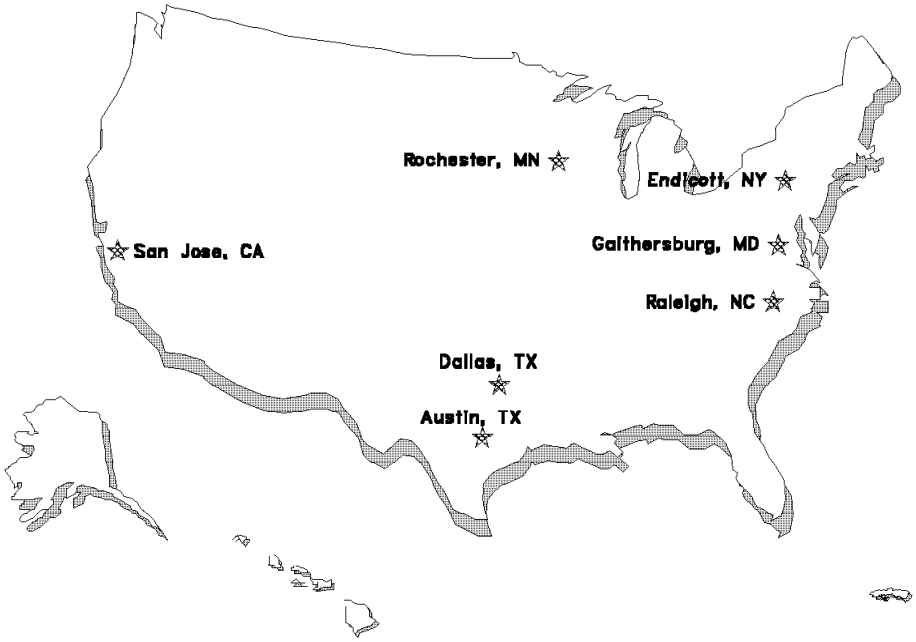

Washington Systems Center
S/390 Technical Support

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Note

Before using this information and the product it supports, be sure to read the general information under “Notices” on page vii.

First Edition

This book applies to the IBM 9037 Sysplex Timer as announced in September, 1990 and enhancements through 1H95.

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Abstract

This manual is a source of information for the issues and questions related to the usage of time on ES/9000 processors and S/390 servers and the 9037 Sysplex Timer. Hopefully it removes some of the mystery surrounding the planning, installation and use of the Sysplex Timer.

The manual is organized into the following sections:

Chapter 1, ″The Usage of Time in S/390 Processors and Servers″

A review of the S/390 architecture and why we needed the Sysplex Timer.

Chapter 2, ″Sysplex Timer Overview″

An introduction to the possible Sysplex Timer configurations and connections.

Chapter 3, ″Software″

A discussion of Sysplex Timer software requirements and customization.

Chapter 4, ″Planning″

How to prepare your 9037 order, processor prerequisites, and machine room.

Chapter 5, ″Operating the Sysplex Timer″

How to use the 9037 Console.

Chapter 6, ″Attaching the Sysplex Timer to the Processor″

What to expect when attaching the Sysplex Timer to your system.

Chapter 7, ″Setting the Time and Offsets″

A review of setting the TOD clocks and offsets.

Chapter 8, ″Recovery″

What to expect from MVS/ESA if things go wrong.

Appendix A, ″What Time is It?″

A historical look at time keeping and how we got here.

Appendix B, ″9037 Log - Reason Codes″

A list of reason codes associated with the Sysplex Timer log.

Appendix C, ″MVS/ESA Messages″

A list of MVS/ESA messages which are Sysplex Timer related.

Appendix D, ″TPF Messages″

A list of TPF messages which are Sysplex Timer related.

Appendix E, ″World-Wide External Time Sources″

A look at external time sources beyond the United States borders.

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Jargon and Acronyms

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Chapter 1. The Usage of Time on System/390 Processors and Servers

This chapter begins with a review of the S/390 architecture and describes *why* we needed a Sysplex Timer.

Coordination of Time-of-Day Clocks among Multiple Systems.

The IBM Enterprise Systems Architecture/390 and IBM Sysplex Timer Architecture (sometimes called ETR architecture) facilitate the synchronization of time-of-day clocks to ensure consistent time-stamp data in an installation with multiple systems. The Sysplex Timer architecture also provides a means by which the TOD clocks can be set automatically, without human intervention, to an accurate standard time source.

Background

There is a long-standing requirement for accurate time and date information in data processing. As single systems have been replaced by multiple, coupled systems, this need has evolved into a requirement for both accurate and consistent clocks among the systems.

In the context of the IBM Enterprise Systems Architecture/390 (ESA/390) architecture, each ″system″ is called a Central Processing Complex (CPC).

Note: Marketing material sometimes uses the term Central Electronic Complex (CEC). Both CPC and CEC have the same meaning.

The CPC consists of one or more central processing units (CPUs) and associated hardware units (such as main and expanded storage, TOD clocks, and channels) that can be configured to operate under the control of a single operating system. A configuration of coupled CPCs that are cooperating to process a common workload is called a System Complex or SYSPLEX for short.

TOD Clock

The TOD clock was introduced as part of the System/370 architecture to provide a high-resolution measure of real time, suitable for the indication of date and time of day. It is a 64-bit unsigned binary counter with a period of approximately 143 years. The value of the TOD clock is directly available to application programs by use of the STORE CLOCK (STCK) instruction, which stores the value of the clock into a storage location specified by the instruction.

Conceptually, the TOD clock is incremented so that 1 is added into the low-order bit position (bit 51) every microsecond. The architecture requires that the TOD clock resolution be sufficient to ensure that every value stored by a STCK instruction is unique, and that consecutive STCK instructions always produce increasing values.

In the System/370 architecture, when more than one TOD clock exists within a shared-storage multiprocessor, the stepping rates are synchronized, so that all TOD clocks are incremented at exactly the same rate, and the architectural requirement for unique and increasing TOD clock values still applies. In the case in which simultaneous STCK instructions are issued on different CPUs, unique-

ness may be ensured by inserting CPU-specific values in bit positions to the right of the incremented position.

A carry out of bit 32 of the TOD clock occurs every 2•• microseconds (1.048576 seconds). This carry signal is used to start one clock in synchronism with another, as part of the process of setting the clocks. The carry signals from two or more clocks may be checked, to ensure that all clocks agree to within a specified tolerance.

The use of a binary counter, such as the TOD clock, for time of day requires the specification of a time origin, or epoch; that is, the time at which the TOD clock value would have been all zeros. The System/370 architecture established the epoch for the TOD clock as January 1, 1900, 0 a.m. GMT.

Requirements for Coordinating Clocks on Multiple Systems

A number of requirements had to be considered in the design of a time distribution and coordination facility for ESA/390 systems:

- The facility had to be a compatible and evolutionary extension of the System/370 TOD architecture. It had to maintain the TOD format and epoch, and the facility had to be accessible by using the STCK instruction.
- Time values had to be accurate in relation to standard, or civil, time. There could be no dependency on a human operator to enter time and date information at every CPC initialization.
- Time consistency had to be maintained among CPCs.

  Consider a transaction-processing system in which the recovery process reconstructs the transaction data from log files. If time stamps are used for transaction-data logging, and the time stamps of two related transactions are transposed from the actual sequence, the reconstruction of the transaction database may not match the state that existed before the recovery process.
- Continuous availability of the time facility was required. If coupled CPCs are cooperating to provide continuous availability of an application function, the time facility must have availability characteristics that exceed those of the individual CPCs. This implies that the time reference could not be integrated into any one CPC, since it would become unavailable when that CPC was being maintained or upgraded or during reconfiguration operations.
- Clock integrity had to be maintained. That is, any failure that might cause a lack of clock consistency had to be made known to programs that depended on that consistency.
- The system environment had to permit multiple CPC model types.
- Time-distribution distances had to be as great as I/O connection distances (which are no longer limited to a single machine room). In addition, there had to be some provision for coordination of time between different locations.
- Operating system support of the time reference facility could not require constant inter-CPC coordination and could not introduce significant overhead.
- The time facility had to be adequate for the needs of the future as well as the present. In particular, the allowable offset between two clocks in different CPCs is limited by the minimum inter-CPC signaling time, which can be expected to diminish for future generations of systems.

The Sysplex Timer Solution

The Sysplex Timer provides a means of synchronizing S/390 TOD clocks in different CPCs with a centralized time reference, which in turn may be set accurately on the basis of an international time standard. The Sysplex Timer architecture defines a time-signal protocol and a distribution network that permit accurate setting and maintenance of consistency of TOD clocks. The hardware elements needed to support these requirements are described in this book.

In a Sysplex environment, the allowable differences between TOD clocks in different CPCs is limited by inter-CPC signaling time, which is very small (and is expected to become even smaller in the future). Some environments require that TOD clocks be accurately set to an international time standard. The Sysplex Timer satisfies these requirements by providing an accurate clock-setting process, a common clock-stepping signal, and an optional capability for attaching an external time source.

A primary goal when designing the Sysplex Timer was to provide a time facility whose availability exceeded the availability of any of the individual sysplex elements. It was also essential that the integrity of the timing information be ensured. This is accomplished by extensive error detection and correction and by high-priority interruptions for situations where there is a loss (or possible loss) of Sysplex Timer synchronization. These interruptions alert the system control programs in all participating systems that they must initiate immediate recovery or an orderly shutdown to maintain data integrity.

We now understand why the Sysplex Timer was needed and what was required to fulfill its promise. Lets proceed to understand its components.

Chapter 2. Sysplex Timer Overview

The Sysplex Timer architecture provides a means of synchronizing TOD clocks in different CPCs with a centralized time reference, which in turn may be set accurately on the basis of an international time standard. The architecture defines a time-signal protocol and a distribution network called the Sysplex Timer Network, that permits accurate setting and maintenance of consistency of TOD clocks. This chapter is a high level introduction of the IBM 9037-001 Sysplex Timer.

When running a System Complex (Sysplex) on multiple central electronic complexes (CEC′s), a common clocking mechanism is required. The IBM 9037 Sysplex Timer is a table-top unit that synchronizes the Time-of-Day (TOD) clocks of up to 16 processor/server sysplex timer attachment ports.

For a list of processors and servers capable of attachment to the 9037, see Table 8 on page 40.

The 9037 allows TOD clocks to be set without human intervention in most cases. The 9037 can reduce errors and recovery time when compared to traditional ways of setting the TOD clock.

Terminology

The IBM 9037 Sysplex Timer is known by many names. Most MVS/ESA manuals use the term ***ETR*** when discussing the Sysplex Timer. The following names generally refer to the same hardware.

- 9037
- ETR (External Time Reference)
- Reference Timer
- STR (Sysplex Timer Reference)
- Sysplex Timer
- Timer

For definitions of these and other terms, see “Jargon and Acronyms” on page 161.

Configurations

Basic 9037 Configuration

This configuration (see Figure 3 on page 25) consists of one console and one 9037. It can provide synchronization for up to 16 processor ports.

The basic configuration can be used for applications that require a source of dependable time signals. When the 9037 provides this source, the user does not need to set the TOD clock at initial program load (IPL). This eliminates user entry errors and inconsistencies across multiple processors or servers.

Expanded Availability Configuration

When the Expanded Availability Feature is installed, two Sysplex Timers, linked to one another, provide a synchronized, redundant configuration (see Figure 4 on page 26). This ensures that no single point of failure will keep the Sysplex Timer signals from reaching the processors.

External Time Source

The 9037 is able to access an External Time Source (ETS). The external time source function permits the Sysplex Timer time to be set to the timestamp provided by the ETS. Once set, the Sysplex Timer will change the TOD stepping rate (either speed up or slow down) to ″steer″ the TOD (and thus MVS/ESA) to the new timestamp value. When the Expanded Availability feature is present and the customer enables automatic time adjust, the time of the Sysplex Timer will be compared to the external time source and adjusted accordingly. This improves the accuracy of the Sysplex Timer and compensates for the effects of clock drift.

RPQ 8K1787

A 9037 Basic Mode configuration may perform a dial-out to an external time source, but it requires RPQ 8K1787 before the 9037 can perform an automatic adjustment to make the 9037 slowly match the time provided by the external time source. The 9037 is then capable of ″steering″ the physical TOD clock time stamps gradually and without discontinuity to MVS/ESA.

RPQ (8K1787) provides FC4048 and installation instructions when only one 9037 unit exists. Engineering Change (EC) C65184 must be installed on the 9037 Sysplex Timer prior to installation of 8K1787.

Console

A customer-supplied console (an IBM personal computer or equivalent), dedicated to each 9037 configuration, allow the user or service representative to communicate with the 9037. The console is used to:

- Enter and display data, such as time and offsets, and to provide port control
- Select the external time source type and its operational parameters
- Collect error information from the 9037s and generate an error log
- Maintain a change log for data entered by the user.

One console is required, in either the Basic or the Expanded Availability configuration. The console cannot support more than two Sysplex Timers. Console configuration and ordering information may be found in Chapter 4, “Planning” on page 25.

The Sysplex Timer console uses a series of pull-down menus for the user to easily communicate with the 9037. There is extensive help for all user tasks. Examples of the console menus and panels may be found in Chapter 5, “Operating the Sysplex Timer” on page 53.

Ports

The Sysplex Timer has four ports available. The Port Expansion feature gives the customer the ability to add 12 additional ports to further enhance reliability and availability by providing redundant connection capability and allow the attachment to more CEC′s.

Growth Enablement

The Sysplex Timer offers port granularity, making it convenient for customers to add ports, meeting their growth requirements and attachment needs. A Sysplex Timer consisting of four ports satisfies the requirements for many data centers. Since three Expansion Features can be ordered, with four ports each, growth can continue to include 16 ports. When the Sysplex Timer is in an Expanded Availability configuration, ports may be added nondisruptively.

Details are provided in Chapter 4, “Planning” on page 25.

Sysplex Timer Signals

The Sysplex Timer architecture defines three signals for clock synchronization, which are sent to each attached CPC, in a single serial bit stream:

- Sysplex Timer *oscillator signal.* This signal is used by each CPC as a common TOD-clock-stepping signal. It ensures that all clocks step at the same rate, so that once they are set to Sysplex Timer time, they will stay consistent with the Sysplex Timer.
- Sysplex Timer *on-time signal.* This signal is used by the clock-setting process as the reference time instant. The on-time signal corresponds to the carry from bit 32 of a TOD clock.
- Sysplex Timer *data signal.* The Sysplex Timer data includes the Sysplex Timer-time value, local-time-zone and leap-second offset information, and link-connection status. For fault tolerance, the same Sysplex Timer data is transmitted several times in one mega-microsecond. Time-offset information is automatically made available to the system control programs in the CPCs for use in time-conversion algorithms. It does not affect the TOD-clock-setting value.

Sysplex Timer Network

A Sysplex Timer network consists of the following three types of elements configured in a network with star topology:

1. sending unit,
2. link,
3. receiving unit.

The sending unit is the centralized Sysplex Timer which transmits signals over dedicated links. It provides a means by which time can be accurately maintained with respect to external standard time services. The receiving unit in each CPC, includes the means by which the TOD clocks are set and maintained consistent with the Sysplex Timer time. The Sysplex Timer Network may comprise one or more Sysplexes and CPCs not belonging to a Sysplex if desired.

It is likely that a large installation may have more than one Sysplex Timer network, in which case it is important that all CPCs within a Sysplex be attached to the same network. The Sysplex Timer data includes network ID information,

which is verified by the system control programs running in the attached CPCs to ensure true consistency of all TOD clocks within a Sysplex.

Skew

The Sysplex Timer provides synchronization alignment signals at the output of all fiber optic ports which are within 0.6 microseconds of each other. This includes an Expanded Availability configuration.

Synchronization

The processors check that they are synchronized every 1.048576 seconds.

Synchronized CPCs

The Sysplex Timer is used to synchronize the TOD clocks of all the CPCs to which it is attached to a very close tolerance. The precision of this synchronization is to a certain extent dependent upon the CPC hardware, but TOD clocks in the CPCs typically vary from one another by only a very few microseconds at most.

Accuracy

Time-Of-Day (TOD) Clock Accuracy

The TOD clock accuracy is processor model dependant. Typically the ES/9000 TOD clock is accurate to within 0.864 seconds per day (when independent of a 9037).

9037 Accuracy

The accuracy of the Sysplex Timer WITHOUT an external time source will typically range within ± 32 seconds per year from an initial time setting. Actual precision may vary with the effects of component aging and machine environment. The accuracy is increased through the use of an external time source. The Sysplex Timer is capable of tracking an external time source to within 0.005 seconds.

Adjustment

A time adjustment capability is a user option available at the Sysplex Timer console. After the initial time is set in the Sysplex Timer, small adjustments can be made without processor disruption either manually or from an external time source. Adjustments from ± 0.01 seconds to 4.999 seconds provide gradual clock rate shift until the desired time value is reached.

External Time Sources Accuracy

ACTS

The National Institute of Standards and Technology (NIST) - Automated Computer Time Service (ACTS) is accurate to within 0.01 seconds of Coordinated Universal Time (UTC). If the 9037 is configured to dial ACTS about once per week, then the 9037 will stay within approximately 1 second of ACTS time. The frequency at which ACTS is dialed can be changed by the user at the 9037 console, depending on your accuracy requirements.

It is possible for countries other than the United States to use the ACTS service by customizing the built-in phone number that the console dials. This is discouraged if very accurate UTC is required since propagation delays will be incurred over satellite or underwater phone links.

Radio Receivers
Typically within 0.1 - 0.5 seconds of UTC.

Time-Code Generator
Typically within 0.1 - 0.5 seconds of UTC.

GPS Satellite Receiver
Typically within ± 100 nanoseconds of UTC.

Note

If you use a stable external time source such as those mentioned, the Sysplex Timer is capable of tracking to these providers to within 0.005 seconds.

Chapter 3. Software

Not all operating systems can take advantage of the 9037. Only MVS/ESA V4 or V5 and Transaction Processing Facility (TPF) contain Sysplex Timer support.

The Sysplex Timer is not ″defined″ to MVS like a device, however there are parameters in the SYS1.PARMLIB dataset which control its use. The parameters in the CLOCKxx member of SYS1.PARMLIB are discussed in this chapter. Software maintenance requirements are also provided.

Although Processor Resource/System Manager (PR/SM) is considered hardware microcode, it is discussed in this chapter since it also contains Sysplex Timer support.

Virtual Machine/Enterprise System Architecture (VM/ESA) guest operating system configurations are also discussed.

MVS/ESA

In a multisystem environment, complexity is reduced by simplifying time synchronization. MVS/ESA SP Version 4 Release 1 and subsequent releases utilize the Sysplex Timer to synchronize time across all processors in the multisystem environment. With MVS/ESA V4 and above, the Sysplex Timer provides a source for time information that enables the operating system to set and maintain synchronization of the time of day (TOD) clock in each processor in a Central Electronic Complex (CEC) without operator intervention. MVS also includes services to applications, subsystems, and operators for determining whether the clocks are synchronized.

A choice of two modes of time synchronization are available.

- Local synchronization mode; where MVS is using the services of the processors TOD clock.
- ETR synchronization mode; where MVS uses the services of the Sysplex Timer.

The default in MVS/ESA V4 and V5 is to synchronize to a Sysplex Timer.

Note: Since the default in MVS/ESA V4 and V5 is to assume that there is a Sysplex Timer present, if you IPL MVS without the Sysplex Timer an informational message is presented. Refer to message IEA265I. Keywords on the CLOCKxx member of SYS1.PARMLIB allow an installation to request local synchronization mode instead, if desired.

The Sysplex Timer uses absolute time rather than Greenwich mean time (GMT). Absolute time is the measurement of time in terms of the standard second. UTC (sometimes called GMT) factors in leap seconds. Modifications have been made to the TIME, STIMER, and STIMERM macros so that these macros continue to return or use GMT/UTC and/or local time.

Two new macros are available to applications and subsystems.

- STCKSYNC provides the contents of the TOD clock and an indicator to specify whether the clock is in synchronization with an external time reference.

- STCKCONV converts an input TOD clock value to the time of day and the date in the format requested in the macro.

SYS1.LOGREC record, type A1, contains External Time Reference related information.

SYS1.PARMLIB(CLOCKxx)

MVS/ESA controls this time representation with the CLOCKxx parmlib member. The parameters of CLOCKxx that are important for this purpose are:

```
TIMEZONE d.hh.mm.ss
ETRMODE YES|NO
ETRZONE YES|NO
OPERATOR PROMPT|NOPROMPT
SIMETRID nn
ETRDELTA nn
```

TIMEZONE d.hh.mm.ss

Specifies the difference between local time and Coordinated Universal Time (UTC). This parameter has the same meaning as in releases of MVS prior to MVS/ESA Version 4, except when ETRMODE YES and ETRZONE YES are specified, in which case the system ignores this parameter.

ETRMODE YES|NO

Determines whether the Sysplex Timer is to control the MVS time. The CEC should be attached to a Sysplex Timer in order to specify YES. MVS/ESA ships from IBM with ETRMODE YES as its default. If you specify YES, the TOD clocks will be set to the time based on the Sysplex Timer. Also, it is possible that the value returned by the STCK instruction is different from the UTC value (due to possible leap seconds). If you specify YES and ETRZONE YES, you are not able to set the local time or date by issuing a SET CLOCK= command.

ETRZONE YES|NO

Specifies whether the system is to get the time zone constant from the Sysplex Timer. The time zone constant specifies the difference between the local time and Coordinated Universal Time (UTC). If you specify YES, any TIMEZONE specification in the CLOCKxx parmlib member is ignored. Further, you are not able to set the local time using the SET CLOCK command. If you specify NO, the time zone is set according to the value of the TIMEZONE parameter in CLOCKxx. Also, you are able to use SET TIME to set the local time and date. Note that specifying NO will make it more difficult to handle daylight savings time changes.

OPERATOR PROMPT|NOPROMPT

Specifies whether the operator is to be prompted to set the TOD clock during system initialization (IPL).

The PROMPT parameter specifies that the system is to prompt the operator during TOD initialization.

The NOPROMPT parameter specifies that the system is not to prompt the operator during TOD initialization unless the clock is not already set.

NOTES:

1. If ETRMODE YES is specified, the system ignores the OPERATOR parameter.

2. OPERATOR and SIMETRID are mutually exclusive keywords. Specify either OPERATOR or SIMETRID, but not both. If both are specified, the system rejects the CLOCKxx member during system initialization, and issues a message to prompt the operator for one of the following:

   - A valid CLOCKxx member or
   - EOB (end of block, by pressing the enter button on the console).

     EOB causes MVS to accept the current TOD value.

   Otherwise, the operator must reIPL the system.

The default is NOPROMPT.

SIMETRID nn

Specifies the simulated ETR identifier. Specification of SIMETRID allows SYSPLEXes between multiple MVS systems running under LPAR or VM on the same CEC, without using a real ETR. If you use SIMETRID nn you have none of the advantages of the Sysplex Timer (such as the ability to centrally set time zones and leap seconds).

Value range for nn is X′00-1F′.

ETRDELTA nn

nn indicates the greatest difference, after IPL, between the system′s TOD and the 9037 TOD by which the system will readjust its TOD, when necessary, to match the 9037 TOD.

After IPL the CEC TOD clock and the Sysplex Timer clock are kept within a very few microseconds of each other. If they exceed this value, nn specifies the maximum difference for which MVS will resynchronize the clocks. If ETRDELTA is exceeded, the system cannot continue in ETR synchronization mode.

The result of being without ETR synchronization depends on whether the system is part of a multi-system Sysplex or not.

1. Processor detecting the time difference is part of a SYSPLEX:

   All processors in the SYSPLEX will be notified that time synchronization has been lost by one (or more) of the processors and all affected processors in the SYSPLEX will load X′0A2′ wait states. Note that MVS/ESA V4 and V5 react differently to X′0A2′ wait states. See “Sysplex Recovery Considerations” on page 97.

2. Processor is not part of a SYSPLEX or is the only processor in the SYSPLEX:

   MVS will continue operation using the time in the processor TOD clock and will not synchronize to the Sysplex Timers clock.

What′s really happening ″under the covers″?

- The 9037 is stepping the processor TOD clock at a 16 MHz rate.
- In addition to stepping the processor TOD, the 9037 sends an ″On Time Event″ (OTE) signal to the processor every 1.048576 seconds.

The ″On Time Event″ is defined as a carry from bit 32 to bit 31 of a clock and should occur every 1.048576 seconds. Receipt of the OTE signal from the 9037 causes the hardware in the processor to check that the 9037 clock and the processor TOD clock execute the carry from bit 32 to 31 within a small window not exceeding several microseconds.

If the OTE carries do not occur at the same time, a synchronization check interrupt is generated. This interrupt causes MVS/ESA to compare the time value of the 9037 clock with the time value in the processor TOD clock. The 9037 sends its time clock value to the processor hardware in between 1.048576 second events. The ETR time value from the 9037 clock is stored in the hardware so that its value can be compared to the value of the processor TOD clock if a synchronization check interrupt occurs. Note that the processor hardware does not compare the time values. The hardware determines only that the two clocks are being ″stepped″ in synchronization when the OTE signal occurs.

If the time value in the two clocks are different by more than ETRDELTA, then MVS/ESA on a processor detecting the time difference will notify the other processors in the SYSPLEX and then load an X′0A2′ wait state. Other processors in the SYSPLEX may also load X′0A2′ wait states, if they also received synchronization check interrupts and the difference between each of their processor TODs and the 9037 clock exceeds ETRDELTA.

If the difference in the processor TOD clock and the 9037 clock is less than ETRDELTA, then MVS/ESA will set the value of the processor TOD to the value of the 9037 TOD clock. The setting of the processor TOD is done by MVS/ESA using a SETCLOCK instruction.

At this point, the actual value specified for ETRDELTA is of interest.

If the processor TOD clock is adjusted ″backward″ in time as the result of MVS/ESA comparing the processor TOD clock and the 9037 clock time after the synchronization check interrupt occurs, there is the possibility that timestamps have already been recorded that are now ″in the future″ by as much as the value of ETRDELTA. This is the case if the value of the processor TOD clock was found to be ahead of or ″faster″ than the 9037 clock.

To avoid problems with time stamps, MVS/ESA will **spin** the Central Processors in the processor complex until the processor TOD clock produces new values. In other words, the processor TOD clock has to ″catch up″ to the time before the adjustment was made. Keep in mind that the 9037 clock is the reference clock and is assumed to be the ″correct″ time.

Should I change the ETRDELTA default?: A specification for ETRDELTA of 10 seconds was felt to be a reasonable amount of time that would not cause system operators or end users undue alarm if the system ″locked up″ for this amount of time. Make the interval longer, 99 seconds, for example, and operators and end users are probably going to notice and perhaps take unnecessary recovery actions.

Why not make ETRDELTA as small as possible, say ″0″ seconds? Zero seconds says no deviation between the processor TOD clock and the 9037 clock can be corrected by MVS/ESA. This is not a good idea. There can be small deviations between the two clocks (microseconds) in the normal course of operation and these deviations can be corrected by the software. There is no sense in putting a processor(s) in the SYSPLEX in a wait state for deviations that can be corrected and are not significant to the operation of the SYSPLEX.

How about 1 second for ETRDELTA? This will work and there is nothing inherently wrong with 1 second as opposed to 10 seconds for ETRDELTA.

The point to keep in mind is that there is no reason for the processor TOD clock and the 9037 clock to be out of synchronization by more than a few microseconds unless:

- The 9037 clock value is set by the user while the SYSPLEX is running - not a wise action! In this case an ETR synchronization check interrupt will be presented to all processors.

  The new value from the 9037 clock can be anything the user enters and if it is more than ETRDELTA-seconds different from the current value of the processor TOD clock, MVS/ESA will cause all SYSPLEX processors to enter the X'0A2' wait state.

- The processors in the SYSPLEX are IPLed with the ETR powered off. MVS in each processor will detect that the 9037 is not present and proceed to use the current value in the processor TOD clock. Later, the ETR is powered on and starts sending data to the processors to which it is attached. MVS/ESA will adjust the processor TOD clock to the 9037 clock time, if the processor TOD clock and the 9037 clock time do not differ by more than ETRDELTA.

  If the processor and 9037 clocks can be synchronized by MVS/ESA, the processors in the SYSPLEX will NOT have to be IPL'ed to restart the SYSPLEX. Admittedly, it may be difficult for the operator to set the processor TOD to a value that it is within 10 seconds of the 9037 clock, but making ETRDELTA smaller surely will not help.

- If the 9037 is powered down for a long period of time, several days or more, the two clocks can drift apart causing a potential synchronization problem when the 9037 is powered on.

In summary, 10 seconds is a good working value for ETRDELTA and should be used unless there is a specific requirement to make the number smaller or larger.

MVS Commands

SETETR

Use the SETETR command to enable ETR ports that have been disabled. An ETR port disabled by a hardware problem can be enabled after the problem has been corrected.

The complete syntax for the SETETR command is: ***SETETR PORT=n***

The command does not have an abbreviation.

- PORT=n

  Specifies the number of the ETR port to be enabled. The valid values for n are 0 and 1.

  Example: To enable ETR port 1, enter:

  ```
  SETETR PORT=1
  ```

You may use the SETETR command to indicate to MVS that an offset change has been made on the 9037 Sysplex Timer. This may be desired only on the ES/3090-T/J, 9021 340 based, and 9121 320 based processors. These processors

may not notice the offset change immediately. Other processors that support the 9037 will notice the time adjustment immediately without operator involvement.

DISPLAY ETR

Use the DISPLAY ETR command to display the current timer synchronization mode and the status of the ETR ports as seen by MVS.

The complete syntax for the DISPLAY ETR command is:

D ETR{,DATA}

- ETR

  Displays the current ETR synchronization and the status of the ETR ports.

- DATA

  Displays the status, in detail, of each ETR port, giving the ETR network ID, ETR port number, and the ETR ID. It is recommended that you use this parameter when displaying the Sysplex Timer status.

  Note: In MVS/ESA V5.2 the "DATA" parameter, indicating detailed status, is displayed by default when "D ETR" is entered.

Example: To display the current timer synchronization mode status and the ETR ports, enter:

```
D ETR,DATA
```

The status is shown in this display:

```
IEA282I hh.mm.ss ETR STATUS
SYNCHRONIZATION MODE=mode  CPC SIDE=id

CPC PORT 0  <== ACTIVE     CPC PORT 1
    OP                         OP
    ENB                        ENB
    ETR NET ID=etrnet          ETR NET ID=etrnet
    ETR PORT=etrport           ETR PORT=etrport
    ETR ID=etrid               ETR ID=etrid
```

The different fields in the message are:

- hh.mm.ss is the current time in hours(hh), minutes(mm), seconds(ss)
- MODE=mode is the current synchronization mode, ETR or LOCAL
- CPC SIDE=id the current CPC side id, 0 or 1
- †OP† is the status of the port, operational or nonoperational
- †ENB† is the status of the port, enabled or disabled
- †ETRNET† is the ETR Network Identifier, in decimal
- †ETRPORT† is the ETR port number, in decimal
- †ETRID† is the ETR identifier, in decimal

MVS/ESA APAR/PTF Requirements for 9037

The following table supplies you with the maintenance required to use a Sysplex Timer with MVS/ESA V4 and V5.

Table 1. MVS/ESA APAR/PTF Support for Sysplex Timer

APAR	MVS/ESA V4.1 PTF (no longer supported)	MVS/ESA V4.2 PTF	MVS/ESA V4.2.2 PTF	MVS/ESA V4.3 PTF	MVS/ESA V5.1 PTF
OW08332		UW11407	UW11407	UW11408	UW11409
OW04279		UW07078	UW07078	UW07079	UW07080
OW04181		UW07125	UW07125	UW07126	UW07127
OY65132	UY96288	UY96289	UY96292	UY96290	
OY55659	UY83996	UY83997	UY83998	UY83999	
OY47359	UY70415	UY70416	UY70416		
OY46492	UY68916	UY68917	UY68918		
OY45107	UY68994	UY68995	UY68995		
OY46148	UY68359	UY68360	UY68360		
OY44865	UY67912	UY67913	UY67914		
OY47995	UY71585	UY71586	UY71586		
OY30610 OY46138	UY90890	UY90891	UY90919 UY90891		
OY47322	UY72773	UY72774	UY72775		

Maintenance and descriptions in this book:

- OY66138 on page 18
- OW09850 on page 81
- OY55659 on page 104
- OY65132 on page 107.

VM/ESA

VM/ESA (or any release of VM for that matter) does not know about the existence of a 9037. VM will operate if a 9037 is attached to the processor, however it does not provide a way to get clock updates from the 9037. VM will not receive any benefit from a 9037.

VM Guests

An MVS/ESA SYSPLEX may be established among VM guests, but the guests still cannot take full advantage of a Sysplex Timer because VM cannot communicate the timer information. MVS/ESA SYSPLEX guests will use VM Timer services and must use the **SIMETRID nn** parameter in SYS1.PARMLIB(CLOCKxx) to synchronize virtual TOD clocks. If the MVS SYSPLEX is to span two processor footprints, then the SYSPLEX must use a common clock. This is *not* possible if the SYSPLEX consists of VM Guest SCP's.

PR/SM LPAR

Processor Resource/Systems Manager (PR/SM) allows a physical processor to be logically partitioned (LPAR′ed) where multiple operating systems can simultaneously be in operation.

PR/SM LPAR microcode can communicate with the Sysplex Timer therefore MVS/ESA V4 and V5 logical partitions can use the 9037 through SYS1.PARMLIB(CLOCKxx) specifications.

PR/SM LPAR microcode will set the processors hardware TOD clocks to be in synchronization with the 9037. Each LPAR is given its own logical TOD clock through the use of a TOD-clock-offset control block for each logical partition. With this control block, the clock in a partition and the physical TOD clock can have different values.

Each partition′s logical TOD Clock is initially set to the same value as the Physical TOD (and 9037) value at every LPAR activation.

Partitions running MVS/ESA with ETRMODE NO or partitions running operating systems that do not support the 9037 are not affected by changes in the physical TOD clock due to the 9037.

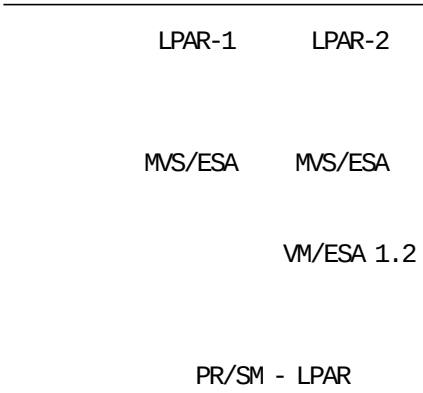
During IPL, each operating system not using the 9037 has the ability to have the operator prompted to set its logical TOD clock if desired. The TOD-clock-offset is maintained and updated when the Logical TOD Clock is manually set by an operator. If the operating system chooses to use the 9037, the TOD-clock-offset is essentially set to zero and all LPARs using the 9037 will be the same value.

Note: When the 9037 is connected to an ES/9000 or ES/3090 LPAR mode system, it is still necessary to enable the automatic TOD setting (B2) on the SYSDEF frame prior to a POR. During the power-on-reset and LPAR activation, LPAR microcode sets the initial logical TOD clock value for all partitions to the Sysplex Timer value.

PR/SM LPAR plus VM Guests

The PTF for APAR OY66138 permits MVS/ESA partitions and MVS/ESA guests running under VM/ESA to create a Sysplex using SIMETRID to simulate a Sysplex Timer. See Figure 1 on page 19.

All MVS/ESA images must be in the same CEC or same side of a physically partitioned multiprocessor.



The two MVS/ESA images in this figure may belong to the same SYSPLEX. Since VM does not know about a 9037, both MVS/ESA's must use SIMETRID in their CLOCKxx parmlib member.

See APAR OY66138 for further information.

Figure 1. Sysplex within LPAR and VM Guest

Transaction Processing Facility (TPF)

The Transaction Processing Facility (TPF) operating system is a high-availability, high-performance system, designed to support real-time, transaction-driven applications. The specialized architecture of TPF is intended to optimize system efficiency, reliability, and responsiveness for data communications and data base processing.

TPF's High Performance Option provides shared database support capability, allowing several (TPF) processors to access a common database. This capability to run loosely coupled can be used when additional capacity is required, or for improved availability.

Prior to the 9037

TPF has required clock synchronization to maintain database integrity in a TPF loosely coupled complex since the 1980s. Prior to the 9037, this was achieved by using one of several processor RPQs available specifically for TPF. Commonly called the TOD Sync RPQ, this RPQ interconnected the TOD clocks of the processors participating in the TPF Sysplex. The base time would be entered by operator command to a single (master) processor, the time would be distributed to the other processors by the software, and the TOD clocks would be kept stepping concurrently by the RPQ.

9037 Considerations

Several of the changes to the user interface for TPF systems is described below. You should refer to the TPF product documentation for more current and more specific information if you are implementing the Sysplex Timer in a TPF environment.

SIP Changes

The keypoint I skeleton, SKCTKI, has been updated to initialize new fields. Several fields are not guaranteed to be initialized properly unless SIP is used to build CTKI, including: IC0MNET, IC0STRID, IC0NETID, and IC0TEXT.

Loosely-Coupled Users Only

Currently, at least one SSAx subparameter is required for each PROCx parameter on the SIP macro CONFIG. With this support, SSAs are only required when the TPF TOD RPQ is included in the complex. If all the CPCs in the complex are directly connected to a Sysplex Timer, then SSA subparameters are not required during system generation.

Functional Message Changes

1. The ZDTIM functional message has been updated with new parameters (STR, ALTPORT) to display the current time on the Sysplex Timer connected to each of the CPC ports. The Sysplex Timer ID and network ID are also displayed. These new parameters are only valid on Sysplex Timer capable CPCs.

2. Several new parameters have been added to the ZATIM functional message:

   a. On Sysplex Timer capable CPCs, the system operator can use a new parameter (STR) on the ZATIM TOD message to indicate that the TOD clocks should be set with the Sysplex Timer time value. It is still possible for the system operator to provide the time value to be used to set the TOD clocks. Keep in mind that if the ZATIM TOD message is issued from a TPF TOD RPQ capable CPC, it is not possible to use the Sysplex Timer time value to set the TOD clocks.
   b. If a Sysplex Timer capable CPC is connected to two uncoupled Sysplex Timers, then the system operator can choose which of the two Sysplex Timers to use as a synchronization source and time source by including/excluding another new parameter (ALTPORT) on the ZATIM TOD message. If the ALTPORT parameter is excluded, the Sysplex Timer on the primary CPC port is used. If the ALTPORT parameter is included, the Sysplex Timer on the alternate CPC port is used. Information on the two Sysplex Timers can be displayed using the ZDTIM Sysplex Timer message, as previously described.
   c. Loosely-Coupled Users Only: a separate RPQ, 8K1731, is required to couple Sysplex Timer capable processors with TOD Sync capable processors. This RPQ is referred to as the TOD Sync compatibility (TSC) RPQ, and is described in more detail below.
   d. Loosely-Coupled Users Only: On TPF TOD RPQ capable CPCs, the system operator can use another new parameter (STRNM) on the ZATIM TOD message to indicate that the complex should receive its synchronization pulses from a Sysplex Timer. This parameter is only valid when the TSC hardware is present in the complex. If the STRNM parameter is not included in the ZATIM TOD message when issued on a TPF TOD RPQ capable CPC, then the default uses the TPF TOD RPQ for synchronization pulses. A Sysplex Timer capable CPC always receives its synchronization pulses from a Sysplex Timer unless it is synchronized locally.
   e. Loosely-Coupled Users Only: Another parameter (TSC) has been added to the ZATIM functional message to indicate that there is TSC hardware in the complex. This option is referred to as the migration functional message and is described in greater detail in the Migration section that follows.

Loosely-Coupled Users Only

The concept of a ″master″ CPC still exists with this support. The ″master″ CPC is established by issuing a ZATIM TOD functional message. Subsequently, ZATIM TOD functional messages cannot be issued on other CPCs unless the BP parameter is included. None of this has been changed for this support. There is a new concept of ″master″ synchronization source with this support. If a TPF TOD RPQ is supplying the synchronization pulses for the complex, then the ″master″ synchronization source is a CPC. In this case, the ″master″ synchronization source is the same as the ″master″ CPC. If a Sysplex Timer is supplying the synchronization pulses for the complex, then the ″master″ synchronization source is the Sysplex Timer. In this case the ″master″ synchronization source is different from the ″master″ CPC.

It is possible for a CPC to come into the TPF complex without being connected to the current synchronization source. For example, a TOD RPQ capable CPC that is not connected to TSC hardware could be brought into a complex that is using the Sysplex Timer as the synchronization source. Such a CPC is allowed into the complex but forced to be locally synchronous. This means that it can participate as a processor in the complex, but there is no synchronization of the time stamps. As a result if the time should drift from the remainder of the complex time sensitive operations could be at risk.

PR/SM Considerations

The Sysplex Timer is supported on TPF running under PR/SM. A TPF image in an LPAR can be loosely coupled with another TPF image (under LPAR or not) only with the Sysplex Timer installed, TPF is not supported loosely coupled under LPAR with the TOD RPQ.

The ALTPORT parameter on the previously described ZATIM TOD and ZDTIM STR functional messages is not allowed while running under PR/SM since PR/SM controls which CPC port is used as the primary. In a non-PR/SM environment, if the master synchronization source is a Sysplex Timer, and a CPC coming into the complex is a Sysplex Timer capable CPC connected to two uncoupled Sysplex Timers, then an attempt is made to keep the CPC compatible by synchronizing to the Sysplex Timer that has the same network ID as the master synchronization source. This may not be possible when running under PR/SM since the primary CPC port cannot be changed. This means the CPC will be ″accepted″ and synchronized locally.

TPF and the TOD Sync Compatibility RPQ 8K1731

A migration path is required to convert a TOD Sync based TPF loosely coupled complex to a 9037 complex. RPQ 8K1731, the TOD Sync Compatibility (TSC) RPQ, allows a processor which has the TOD Sync RPQ to coexist in a complex with processors using the 9037 Sysplex Timer.

RPQ 8K1731 includes a logic card for the 9037 which transmits time synchronization signals originating in the Sysplex Timer to a distribution/connector unit via a 2.4 meter (8 feet) OEMI cable (P/N 5346809). The cable and the distribution unit are also part of the RPQ. The distribution unit permits the attachment of up to eight processors. RPQ 8K1731 does not use any of the native 9037 ports.

Only one TSC can be connected to a single 9037, In addition, there is no capability to automatically fallback from one TSC to another, even if the 9037s are in an Expanded Availability configuration.

Processors connected to a 9037 through the TSC only get timer oscillator pulses from the 9037, and not the time stamps. The time stamp is supplied from another processor in the TPF complex by the software, as is the case when only the TOD Sync RPQ is available.

The figure below shows 9037 capable, and TOD Sync processors in a single (TPF) Sysplex. The ES/3090 processors will not get their timestamps from the 9037, but rather the timer oscillator pulses. The 9121 and the 9021 will get their time stamps from the 9037.

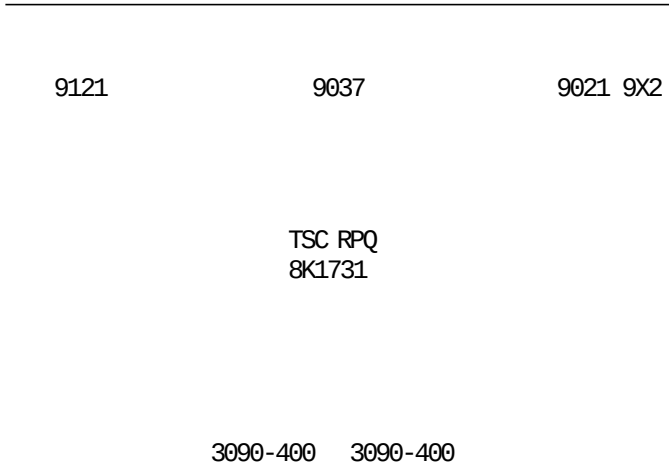


Figure 2. TSC RPQ - 8K1731

Migration for a Loosely-Coupled Complex

If the customer is going to have TOD RPQ CPCs and STR CPCs in the same loosely-coupled complex, then the following migration path should be followed:

1. Apply this APAR and use SIP to create CTKI (see SIP changes previously described).
2. Load the new code including a keypoint I load.
3. Attach the Sysplex Timer directly to the Sysplex Timer capable CPCs.
4. Attach the Sysplex Timer to the TOD RPQ CPCs through the TOD Synchronization Compatibility (TSC) hardware. A TSC is required for each Sysplex Timer, even when a Sysplex Timer is part of an Expanded Availability configuration (high availability). The TSC must be connected to the same TOD RPQ port on all the TOD RPQ CPCs.
5. IPL the system with the new code. Before the Sysplex Timer can be used as a synchronization source, the following migration functional message is required in order to update CTKI (IC0STRNM, IC0NETID, IC0STRID, and IC0ESSA) with the appropriate Sysplex Timer information: ZATIM bbbb TSC STRNM-strname NETID-netid STRID-strid SSA-ssa where:
   - bbbb is a base time.
   - strname is a 1-4 character name chosen by the customer used to identify the Sysplex Timer.
   - netid network ID of the Sysplex Timer. This can be displayed on the PS/2 attached to the Sysplex Timer.

- strid Sysplex Timer ID of the Sysplex Timer. This can be displayed on the PS/2 attached to the Sysplex Timer.
- ssa the TOD RPQ port used to attach the TSC.

Reference the ″Migration Aids″ appendix in the System Generation Guide and ZATIM in the Operations Guide for a complete description of this migration functional message. A migration functional message is required for each TSC in the complex. Each Sysplex Timer must have a unique STRNM.

Even if two Sysplex Timers are part of the Expanded Availability configuration, they each must have a unique STRNM.

6. The Sysplex Timer can then be used as the synchronization source by issuing a ZATIM functional message. If the ZATIM message is issued from a Sysplex Timer capable CPC, then the Sysplex Timer is automatically used as the synchronization source. If the ZATIM message is issued from a TOD RPQ CPC, then the STRNM parameter must be included in the message for the Sysplex Timer to be used as the synchronization source. The name given on the STRNM parameter must match the name given on the STRNM parameter in the migration functional message as previously described. See the Operations Guide for a complete description of the ZATIM functional message.
7. If the customer wishes to fall back to using the TOD RPQ as the synchroniza tion source instead of the Sysplex Timer, then another ZATIM functional message must be issued without the STRNM parameter on a TOD RPQ CPC. Note that the Sysplex Timer capable CPCs are not able to synchronize to the TOD RPQ and are synchronized locally. The TSC can be used to connect TOD RPQ CPCs to a Sysplex Timer even when there are no Sysplex Timer capable CPCs in the complex. The Sysplex Timer can then be used as the synchronization source although the operator has to supply the time for the complex since the Sysplex Timer time cannot be read by a TOD RPQ CPC.

   The migration path previously described should still be followed.

Chapter 4. Planning

This chapter is intended to help you plan for the ordering and installation of your IBM 9037 Sysplex Timer. Ordering specifications are discussed in addition to special hardware prerequisites and physical planning information.

Sysplex Timer Configurations

The Sysplex Timer can exist in two configurations.

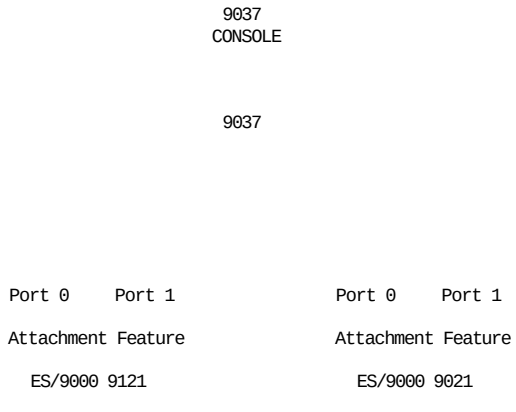
1. Basic (one 9037)
2. Expanded Availability (two interconnected 9037s)

Basic 9037 Configuration

The Basic configuration, Figure 3, uses one Sysplex Timer and one console to provide signals to multiple processors with minimum backup capability.

If an Attachment Feature port, Sysplex Timer port, or link failure occurs, the secondary port is automatically available as a backup. If a failure occurs in the Sysplex Timer or through the last available path to the Sysplex Timer, time synchronization is lost.

The basic configuration can be used for applications that require a source of dependable time signals. When the 9037 provides this source, the user does not need to set the TOD clock at initial program load (IPL). This eliminates entry errors and inconsistencies across multiple processors, processor sides, or S/390 Servers.



- 9037 Port redundancy
- Processor Port redundancy
- Link redundancy
- ***No*** 9037 redundancy
- Switch-over is automatic

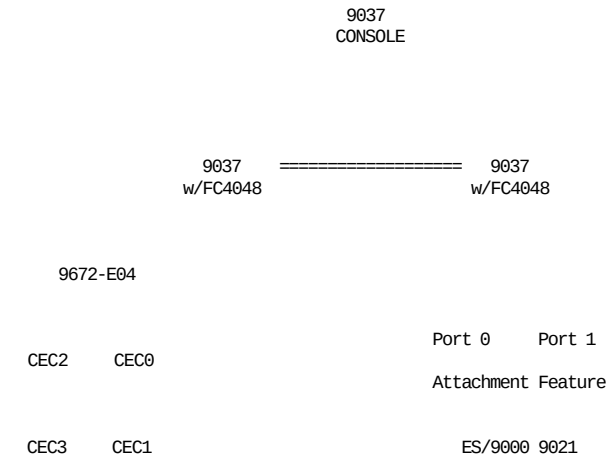
Figure 3. Basic (one 9037) Configuration

Expanded Availability 9037 Configuration

The Expanded Availability feature is recommended when multiple processors share access to the same data and workload such as when implementing a Parallel Sysplex, or when full redundancy is required.

This configuration consists of one console and two 9037s. The two 9037s transmit the same time synchronization information to multiple processors or S/390 Servers.

The Expanded Availability feature (FC4048), Figure 4, links two Sysplex Timers together to provide redundancy, thus reducing the probability of losing time synchronization because of any single point of failure. A chargeable feature code (FC4048) on each of two 9037s provides a connection between them called the Expanded Availability feature. The 9037-to-9037 connection is a redundant, special purpose copper cable and does NOT require the use of a normal 9037 optical fiber port.



- 9037 Port redundancy
- Processor Port redundancy
- Link redundancy
- 9037 redundancy
- Switch-over is automatic

Figure 4. Expanded Availability Multiple CEC's

Physically Partitioned multiprocessor

Multiprocessors are ***required*** to have a Sysplex Timer Attachment Feature on both sides. This is true even if the multiprocessor is physically partitioned.

When a multiprocessor is physically partitioned (Figure 5 on page 27), it is similar to having two separate CEC's. Each processor side should be cabled to a 9037 pair redundantly so that failure of one 9037 is backed up by a second 9037. Also if an Attachment Feature Port fails, the redundant port on that attachment feature will automatically become active.

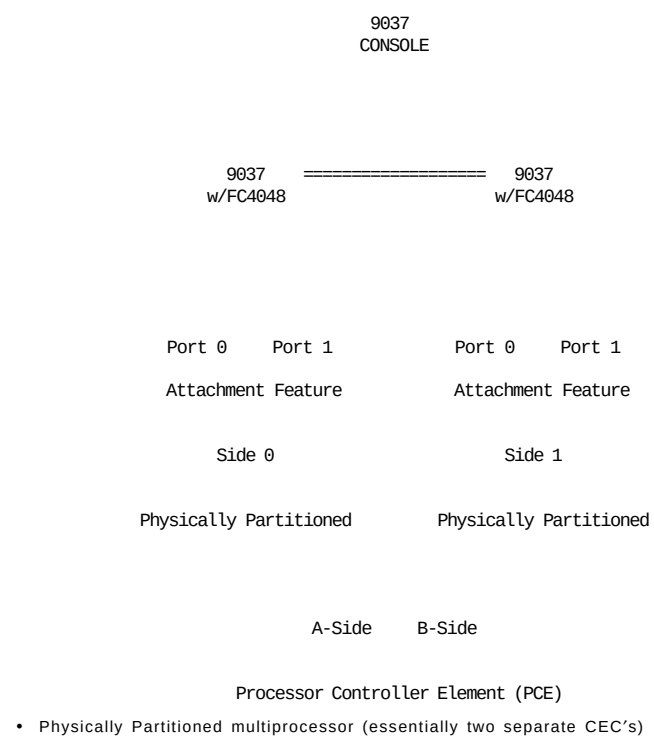


Figure 5. Expanded Availability PP-Mode

Single-Image multiprocessor

Multiprocessors are ***required*** to have a Sysplex Timer Attachment Feature on both sides.

When connecting a 9037 pair to a Single-Image multiprocessor, the fiber optic cables are cross-connected for availability to two Sysplex Timer Attachment Features.

All Sysplex Timer ports are continuously and simultaneously transmitting, but only one Attachment Feature per processor is actively communicating time signals to the processor TOD clock at a time.

On all multiprocessor models, the side with the active Attachment Feature is determined at power-on-reset by the active side of the duplex Processor Controller Element (PCE). If the PCE Side-A is active, then following a power-on-reset the active Attachment Feature is Side-0. If the PCE Side-B is active, then following a power-on-reset the active Attachment Feature is Side-1.

On the 9121 511-based multiprocessors and the 9021 711-based multiprocessors, the standby Attachment Feature is ready to immediately become the active side in the event of a failure of the currently active attachment feature. Other multiprocessor models must perform a power-on-reset before the active sides attachment feature can be switched. For further information, see "Single-Image Multiprocessor Recovery" on page 106.

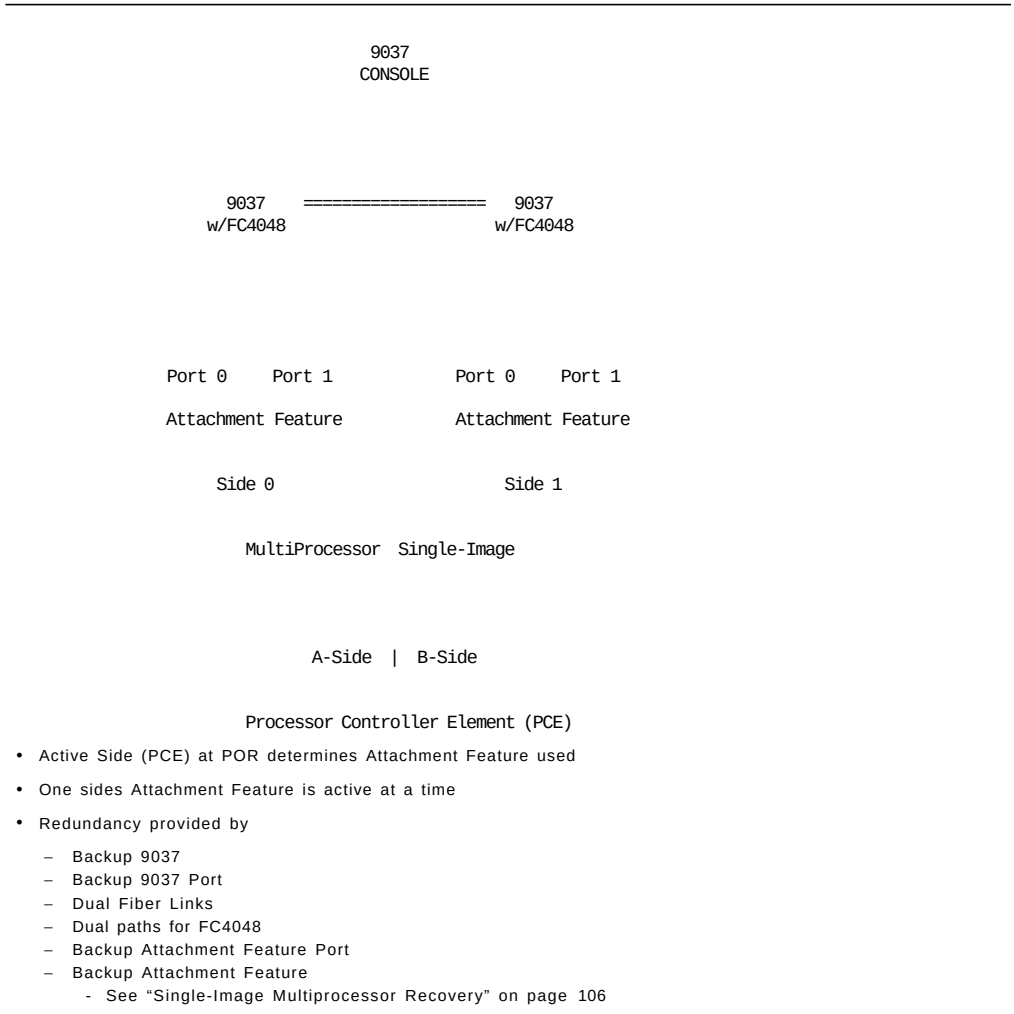


Figure 6. Expanded Availability SI-Mode

Ports

Each 9037 initially has four ports for attachment to processors. Additional ports may be ordered in increments of four either initially or by subsequent upgrades. Four ports at a time are added by ordering FC4040 (Port Expansion Feature), to configure a total of 16 ports per 9037. See Table 2 on page 29.

The 9037 ports are attached by multi-mode fiber optic cables to a ***Sysplex Timer Attachment Feature*** on the processor/server.

Note: The Sysplex Timer is not channel attached and therefore is not defined to the Input Output Configuration Program (IOCP), MVS Configuration Program (MVSCP), or Hardware Configuration Definition (HCD). Also, the Sysplex Timer links may not be routed through an ESCON Director as the two architectures are different.

Each processor/server is normally attached to the Sysplex Timer with a minimum of two ports. If the system is a multiprocessor (MP), both sides must have a Sysplex Timer Attachment Feature, providing a total of four ports. Each Sysplex Timer Attachment Feature is a chargeable processor feature code.

Table 2. 9037 Port Increments (one 9037)

Increments	Feature Code	Total Ports
Standard	None (initial support)	4
1	FC4040	8
2	FC4040	12
3	FC4040	16

Console

Configuration Requirements for the Console

Configuration requirements for the console are as follows:

- 0.5MB memory
- One double-sided 1.44MB Diskette Drive (3.5 inch)
- Enhanced Keyboard
- Compatible Display

If a console is ordered in conjunction with the 9037, then FC9603 should be specified on the Personal Computer order. This will ensure the Personal Computer order is routed to the Sysplex Timer plant of manufacture, and shipped with the Sysplex Timer. Order the console under the same System Number as the Sysplex Timer.

Since Personal Computer models change frequently, the PC model that is integrated with the Sysplex Timer order will change over time. Therefore specific PC model numbers are not listed in this book. Please refer to the current model listed in the 9037 Sales Manual on HONE or IBMLINK. If your console is not merged with the 9037 order, some of the following specify codes must be ordered.

- FC9202

  This specify code is used with FC9205. Specify if console is Micro Channel equipped. This is not for the second unit in an Expanded Availability configuration.

- FC9203

  This specify is used with FC9205. Specify if console is not Micro Channel equipped. This is not for the second unit in an Expanded Availability configuration.

- FC9204

  Specify to generate order for console to be plant-merged. This is not for the second unit in an Expanded Availability configuration.

- FC9205

  You must also specify either 9202 or 9203. Specify to bypass ordering of the console if customer will supply console (either Micro Channel equipped or non-Micro Channel equipped; see FC9202, and FC9203). This is not for the second unit in an Expanded Availability configuration.

Cables

Console Cable

The console adapter card cable, part number 58F0898, is provided by IBM. The console adapter is constructed so that it will accept two 9037s when the Expanded Availability configuration exists. The cable is ***3 meters (9.84 feet)*** long.

Control Link Cables

The Control Link Cables, part number 73F4935, are provided by IBM. These are copper cables that provide communication between two 9037s when the Expanded Availability option is ordered. These cables are ***3 meters (9.84 feet)*** long. The maximum distance between two 9037s in an Expanded Availability configuration should not exceed 2.2 meters (7.22 feet) to allow for internal routing and slack.

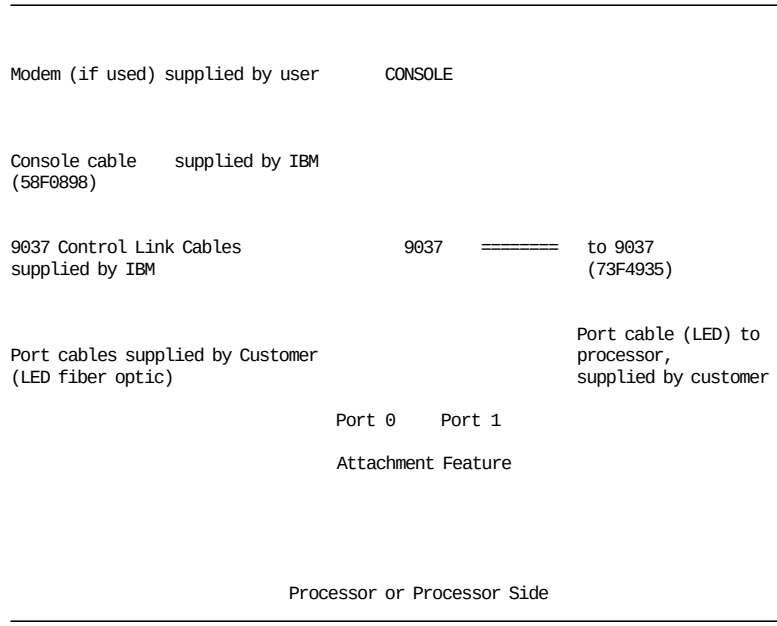


Figure 7. Cables

Optical Fiber Cables

Multi-Mode fiber optic cables are used to attach the 9037 to the processors Sysplex Timer Attachment Facility. These light emitting diode (LED) cables are ordered and purchased by the customer. Cable lengths may be up to 3,000 meters (1.87 miles) for 62.5/125-micrometer fiber and 2,000 meters (1.24 miles) for 50/125-micrometer fiber.

When installing these cables, an additional 2 meters (6.56 feet) of slack must be provided to allow for the positioning of the 9037 and the cable routing within the 9037.

Duplex to duplex 62.5/125 micrometer fiber optic jumper cables **(Group #3797 and cable assembly number 14F3797)** are available in the following standard lengths, and are chargeable.

- 4 meters (12 feet)

- 7 meters (20 feet)
- 13 meters (40 feet)
- 22 meters (70 feet)
- 31 meters (100 feet)
- 46 meters (150 feet)
- 61 meters (200 feet)
- 77 meters (250 feet)
- 92 meters (300 feet)
- 107 meters (350 feet)
- 122 meters (400 feet)

Custom cable lengths in one foot increments are available for a charge from 4 meters (12 ft) up to a maximum of 500 meters (1640 ft).

Link Tuning (propagation delay)

When the 9037 was first announced there was a rule that **all** fiber optic cable connections to the **same** processor had to be nearly the same length. This restriction was removed by subsequent System Engineering Change (SEC) levels to the 9037 and engineering patches to specific processors.

Propagation delay is eliminated if the processor SEC/patch set matches those in Table 8 on page 40 and the 9037 is at SEC:

- C65184 (if 9037 shipped from plant)

  or

- C65184A (if by SEC upgrade).

The prerequisite processor complex SEC and patches should be installed regardless of whether or not the cables are the same length.

Note that the SEC and patches can be installed on any/all attaching processors regardless of whether the 9037 is at SEC C65184 OR C65184A. However, all processors ***MUST*** be at the required SEC and patch levels before attaching to a 9037 at EC C65184 or C65184A!

Trunk Cables

Fiber optic trunks terminated in distribution panels are recommended in large single room data centers, multiple room and multiple floor data centers, and in data centers spread among buildings.

Fiber optic links including 62.5/125 micrometer, 800MHz-km bandwidth trunk cable are supported up to 3 kilometers. Fiber optic links including 50/125 micrometer, 800MHz-km bandwidth trunk cable are supported up to 2 kilometers.

Use of trunks requires additional jumper cables and components. For more information regarding ESCON Trunk Cables, see ***"Planning for Enterprise Systems Connection Links"*** (***GA23-0367).***

Propagation Delay and Trunk Cables

The 9037 automatically compensates for propagation delay through the fiber optic cables. Therefore, the effects of different fiber cable lengths are nearly transparent to processor TOD clock synchronization.

It is important to note that the difference in length between the transmit and receive fibers must be less than 10 meters for the 9037 to effectively perform the compensation. This is not a problem with duplex-to-duplex jumper cables, where the fibers are the same length. However, this is an important consideration when laying trunk cables and using distribution panels. Another important consideration when laying trunk cables in an Expanded Availability configuration is to have the redundant fibers in physically separate trunks. This way if one cable path gets damaged, the alternate can be used.

9037 Extended Distance (Single-Mode Fiber) Configuration - RPQ

Distances between the Sysplex Timer and CEC's beyond 3,000 meters are supported by RPQ 8K1919.

RPQ 8K1919 allows the use of Single Mode Fiber Optic (laser) links between the processor and the 9037. To support single mode fiber on the 9037, a special LED/laser converter has been designed called the 9036 Model 003. The 9036-003 is designed for use only with a 9037, and is available only as RPQ 8K1919. Two 9036-003 extenders (2 RPQ's) are required between the 9037 and each Sysplex Timer Attachment Port on the processor.

Note: ESCON Directors do NOT provide any additional 9037 cabling distance capabilities and they CANNOT be used. Directors do not support the external time reference (9037) architecture.

RPQ 8K1903 is a 9037 RPQ which refers the reader to RPQ 8K1919 for the special purpose 9036-003 Extender.

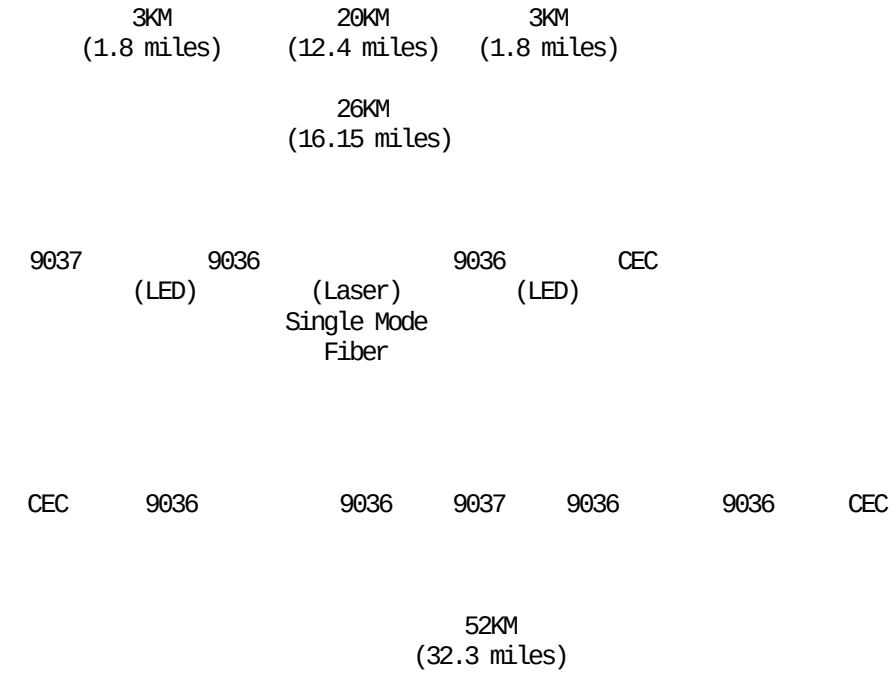
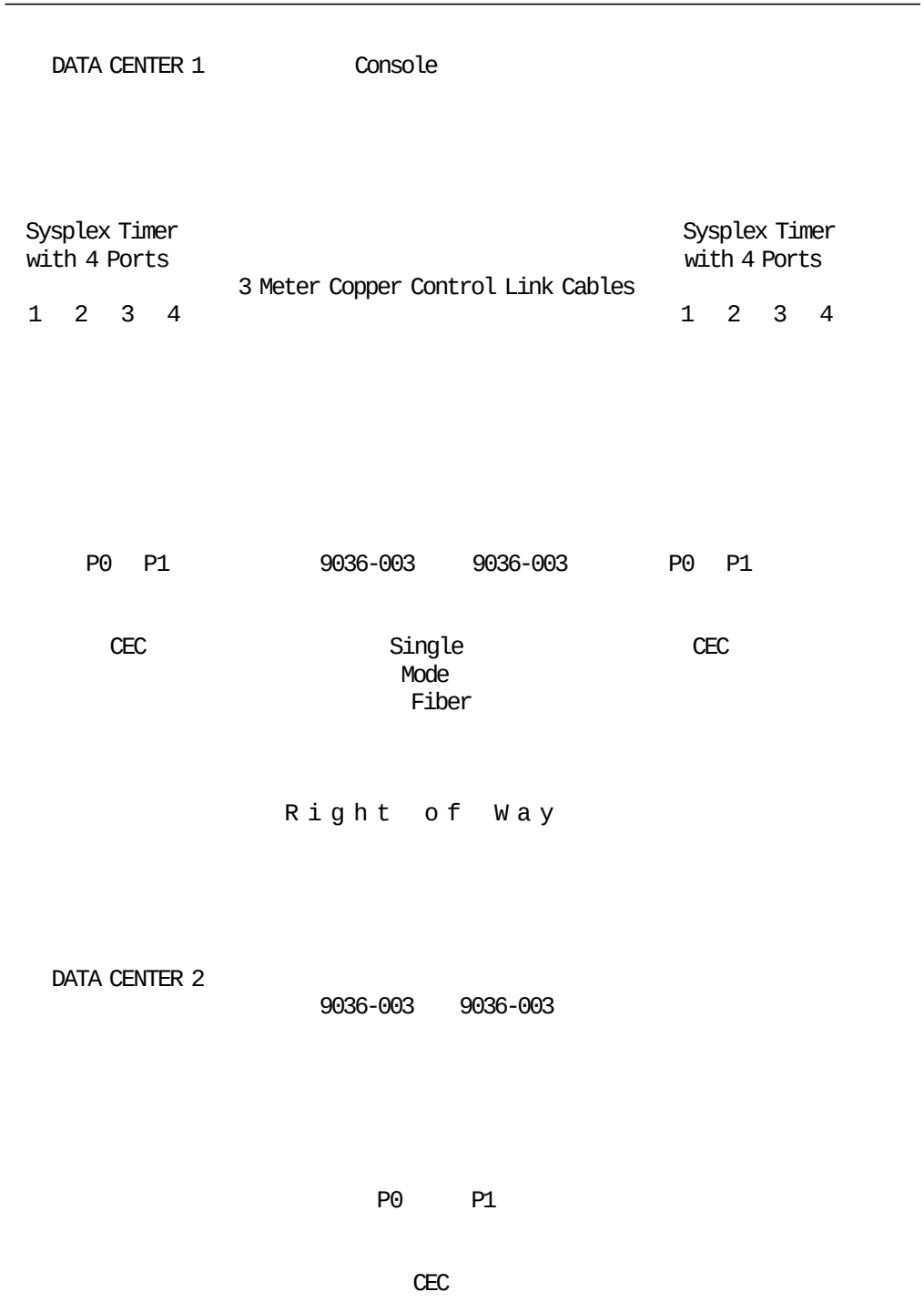


Figure 8. 9037 Extended Distances using 9036-003



This figure is an example of how a configuration might look, with single mode fiber cabling running throughout a campus environment. In this arrangement, several buildings may have access to the same 9037 Sysplex Timer network.

Figure 9. 9037 Extended Distance Configuration (RPQ 8K1919)

9037 Requirements

Table 3. Sysplex Timer Engineering Change (EC) History

ECA	Date	EC Number	Console SW	Description	Comments
ECA001 P/N 86F2996	9/90	C23043	V1.0	General Availability	
ECA002 P/N 02G5577	6/92	C65184	V2.0	Link Tuning (Propagation delay)	Two hour outage required.
P/N 54G2896	1/94	D32722	V3.0	Special Purpose RPQ Version	Do not use this software version without specific RPQ approval. Use V2.1.
ECA003 P/N 54G3329	11/94	C95650	V2.1	Fix Year-end problem. See "Year-End Problem" on page 108.	No outage required. CE: see RETAIN (HSF search) record number H065074 for omitted installation steps.
				Fix Console problem with cached PC's	

Physical Planning

This section provides general information about physical planning and site preparation. For additional information on hardware installation and physical planning information, see the Input/Output Equipment Installation Manual - Physical Planning (IMPP); GC22-7064.

Placement

The Sysplex Timer is designed to sit on a table. If you are installing two Sysplex Timers in an Expanded Availability configuration, they must be within approximately seven feet of each other. Stacking of one Sysplex Timer on another is not recommended.

Dimensions

Table 4. Dimensions

	Front (width)	Side (length)	Height
mm	483	713	225
(in.)	(19)	(28.1)	(8.9)

Service Clearances

Table 5. Service Clearances

	Front	Rear	Left	Right
mm	914.4	914.4	101.6	25.4
(in)	(36)	(36)	(4)	(1)

Weight

30 kg (65 lbs.)

Power Requirements

0.21 kVA at 220 V

Hz 50/60

Voltage 200-240 V ac

If you are installing an Expanded Availability Sysplex Timer, **use separate power circuits for each 9037**.

The 9037 console uses a standard 110V power outlet.

Power Failures

Power Failures

A power failure will cause the Sysplex Timer to stop transmitting. For this reason it is recommended to *use separate power circuits to each 9037* in an Expanded Availability configuration.

The 9037 contains a battery, located in the 9037 base logic card, that is used during power failures. The battery will maintain vital configuration information about port attachments, scheduled events, and current date/time.

When power is restored to the 9037, it resumes transmitting data without operator intervention. If a power failure occurs and the 9037 is unavailable during a scheduled event, such as a scheduled offset change or scheduled dial-out, the event will be performed when power is restored to the 9037.

The battery has a life of approximately 5 years. Replacing the battery requires that the 9037 be powered off. A 9037 Expanded Availability configuration would allow batteries to be replaced, concurrent with operating system operation, one 9037 at a time. See “Upgrades” on page 51 for instructions on powering off one 9037 at a time.

Power Cord

No feature code is required to order the default option.

Table 6. Power Cord

Feature Code	Length meters (feet)	Plug type	Country
Standard	3.2 (10.5)	K	US, Canada
FC9801 non-locking water-tight	3.2 (10.5)	A2	US, Canada
FC9894 twist-lock	3.2 (10.5)	L	US, Canada
FC9986 non-locking	1.7 (5.5)	K	US
FC9896 non-locking water-tight	1.7 (5.5)	A2	US
FC9511 twist-lock	1.7 (5.5)	L	US

Power Plug

For more information on plug types, see the Input/Output Equipment Installation Manual - Physical Planning (IMPP); GC22-7064.

Plug type descriptions from the table above.

- K -- RussellStoll 6-15P; Receptacle = 6-15R
- A2 -- RussellStoll 3720U-2; Receptacle = 3743U-2
- L -- RussellStoll 6-15P; Receptacle = 6-15R

Environmentals

Operating Environment

- Temperature:
  - 10 to 40 degrees C
  - 50 to 104 degrees F
- Relative Humidity:
  - 8 percent to 80 percent
- Max Wet Bulb
  - 27 degrees C
  - 80 degrees F

Modem

The modem used should be compatible with the Hayes Smartmodem command set. In addition, the modem must operate in asynchronous mode at 1200 bits per second with 8 data bits, 1 stop bit, and no parity.

The internal modems compatible with the 9037 console are:

- Hayes Smartmodem 1200B or equivalent
- IBM PS/2 computer 300/1200/2400 Internal Modem/A or equivalent

An external modem must be compatible with the EIA-232 data terminal port of the 9037 console.

EIA-232 Interface Pin Definitions

The Requested Standard #232C (RS-232-C) was formally adopted by the Electronics Industry Association (EIA) and is now called EIA-232. There are two connectors specified by the standard; DB-25 and DA-9. The EIA-232 Interface Pin definitions for DB-25 and DA-9 connectors wired as Data Terminal Equipment (DTE) are shown in Table 7.

Table 7. EIA-232 Pins

DA-9	DB-25	I/O	Signal Name
3	2	O	Transmit data (to DCE)
2	3	I	Receive data (from DCE)
7	4	O	Request to send
8	5	I	Clear to send
6	6	I	Data Set Ready
5	7	-	Signal ground
1	8	I	Data Carrier Detect
4	20	O	Data Terminal Ready
9	22	I	Ring Indicator

EIA-232 Protocol for an External Time Source

The 9037 console recognizes three different EIA-232 time-code protocols used by attached time-code receivers and time-code generators. For all three protocols, the data transmission type is serial asynchronous by character, and the ASCII character code is used. Time information is interpreted by the 9037 as UTC time.

For a detailed description of the three supported protocols, see Chapter 2 of the publication titled ***Planning for the 9037 Sysplex Timer, GA23-0365.***

External Time Sources & Connection Configurations

There are several different external time source choices. All selections may not be available in your geographic location or country. The use of an external time source will improve accuracy, but will also add further costs. The least costly solution in the United States (and the choice made most often) is Automated Computer Time Service (ACTS).

Automated Computer Time Service (ACTS): The National Institute of Standards and Technology (NIST) provides the ACTS service from Boulder, Colorado. For most, this will require a long distance call every time ACTS is dialed.

The 9037 can be configured to automatically dial ACTS on regular intervals based on your last successful dial-out. The intervals can be based on days (ddd) or hours (hh). Dialing-out once a week should keep the Sysplex Timer within 1 second of ACTS at all times.

ACTS Phone Number

ACTS is a free service provided by the U.S. government. No registration is necessary. The phone number that the modem dials is in the 9037 profile when shipped from the plant. The number is ***1-303-494-4774***.

The External Time Source attaches to the 9037 through the serial port (EIA-232) of the 9037 console. When using ACTS, a modem must be supplied by the user and must be Hayes compatible. The modem must be set to operate in asynchronous mode at 1200 bits per second with 8 data bits, 1 stop bit, and no parity.

If the customer chooses to use a radio receiver or another means to obtain timestamps from an external time source, a modem is not required. These other choices connect directly to the 9037 console EIA-232 serial port.

Radio Receivers: Low-frequency radio receivers are used to receive standard time-code transmissions from radio station WWVB in Fort Collins, Colorado, U.S.A.

A list of other countries radio transmission authorities may be found in Appendix E, “World-wide External Time Sources” on page 155.

A receiver is required. These receivers are relatively low in cost and provide accurate time, typically within 0.1 to 0.5 seconds of Coordinated Universal Time (UTC). At times outages can occur due to atmospheric disturbances and only certain geographic areas can pick up the radio signal. A radio antenna or signal amplifier may be required which add further cost.

Time-Code Generator: A time-code generator can be used to synchronize to an IRIG-B (inter-range instrumentation group - B) input time-code format. The time format can be supplied to the 9037 EIA-232 protocol required by the 9037 console. This allows the 9037 to be connected to an existing time distribution network, typically within a campus environment. After starting the time-code generator, accurate time can be maintained by a high-precision oscillator such as an atomic clock.

Figure 10 shows the different installation possibilities for obtaining UTC from an external time source.

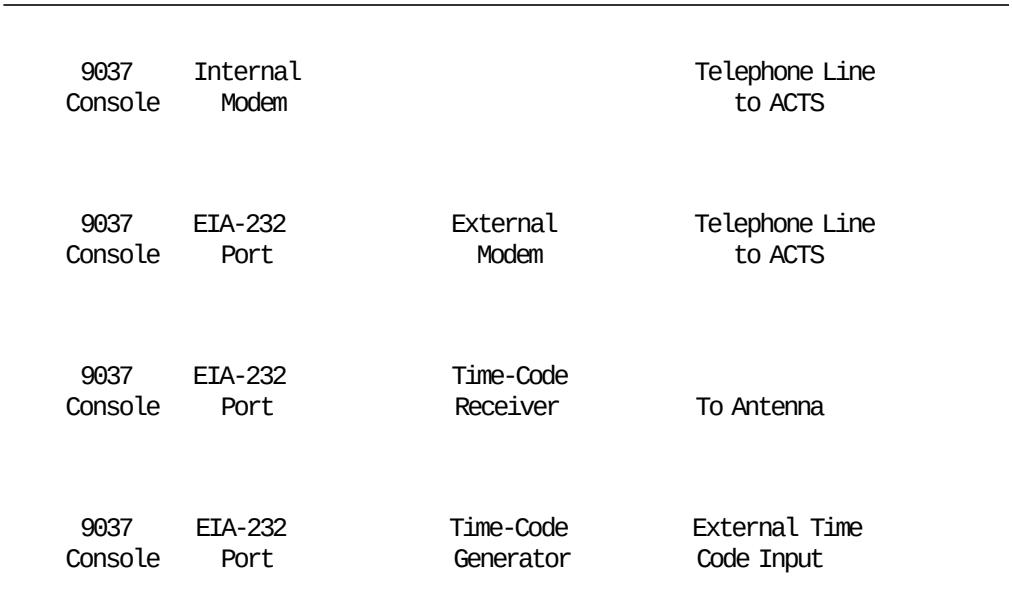


Figure 10. External Time Sources

Processor/Server Requirements

At the time of publication, only the processors/servers listed here are Sysplex Timer capable. Processor/server feature codes needed for attaching the Sysplex Timer are examined.

The Sysplex Timer was first announced on September 9, 1990 as part of the initial announcement of Sysplex, ESCON, and the ES/9000 processor family. All of the ES/9000 family is capable of participating in a Sysplex and using a Sysplex Timer. To enhance and protect clients recent investments, IBM offered upgrade options from selected ES/3090 models to new ES/3090-9000T models which supported the enhanced ESA/390 architecture. In addition, selected 3090-J models were also enhanced.

The 9037 Sysplex Timer may be connected to the ES/3090 T-models and J-models, ES/9000 9021, 9121, 9221, 9672, and 9673. Processor complexes attaching to the Sysplex Timer must be at one of these ***minimum*** System Engineering Change (SEC) levels with specified microcode patches. ***For best results, your system should be at its most current Engineering Change level. Your IBM Service Representative can obtain and install the most current level.***

Table 8 (Page 1 of 2). Minimum Sysplex Timer Capable Processors and Requirements

Processor	SEC	Patch-Set
9221 (all models)	Rollout 3 or higher (EC C85851)	N/A
9121 320-based (180, 190, 210, 260, 320, 440, 480, 490, 570, 610)	C23074B, C22822, C22827	STXT2767, NSHR1529-1534, STXT3418-3425, ZFIL1553, NSHR1373-1387, NSHR1612-1616
	C22830A	STXT3427-3434, ZFIL1555
	C22835	STXT3500-3501, NSHR1662-1666, NSHR1690
9121 511-based (311, 411, 511, 521, 621, 522, 622, 732, 742)	ANY	N/A
9021 340-based (330, 340, 500, 580, 620, 720)	229910	NSHR1133, NSHR1224-1237, NSHR1332, NSHR1334, NSHR1340, NSHR1360-1363, NSHR1395-1396, NSHR1414-1415, NSHR1535-1540, STXT3119, STXT2765
	229914	
9021 520-based (520, 640, 660, 740, 820, 860, 900)	228104A	NSHR1308-1311, NSHR1333, STXT3118
	228110	NSHR1581, NSHR1573, NSHR1668
	228112	NSHR1658, NSHR1648, NSHR1661
	228150	NSHR2529, NSHR2530, NSHR2531
	228250	NSHR2532, NSHR2533, NSHR2534
	228270	NSHR2536, NSHR2537, NSHR2538
	228420	NSHR2535

Table 8 (Page 2 of 2). Minimum Sysplex Timer Capable Processors and Requirements		
Processor	SEC	Patch-Set
9021 711-based (711, 821, 822, 831, 832, 941, 942, 952, 962, 972, 982, 9X2)	ANY	N/A
3090 T & J-models (180J, 200J, 280J and above)	227576	NSHR1210-1223, NSHR1301, NSHR1331, NSHR1341, NSHR1541-1546, NSHR1397-1398, NSHR1416-1417, NSHR1607-1611, STXT2766, STXT3087, STXT3388-3396, ZFIL1546-1547
	227578	
9672 (all models)	ANY	N/A
9673 (all models)	ANY	N/A

Required Processor/Server Outages

The Sysplex Timer attaches to a specific feature on the processor. The appropriate chargeable attachment feature must be ordered and installed. **The installation of the attachment feature requires a processor outage.** Once installed, the processor may be used without a Sysplex Timer without affecting operations.

Table 9. System Outage for installation of Sysplex Timer Attachment Feature	
Processor/Server	Customer outage
9221	2.6 hours
9121	1.5 hours
9021	2.5 hours
3090	1.5 hours
9672	1.0 hours
Note: Per side on multiprocessor's	

Sysplex Timer Installation Time

The Sysplex Timer will be installed by IBM service personnel. Installation time is approximately

- 1.2 hours for the basic unit
- 1.7 hours when the Expanded Availability Feature is ordered (two 9037s).

ES/9000 9221 Air Cooled Rack Processor

Feature Code 6150 allows attachment of the Sysplex Timer on the 9221 processor. This feature is known as the STA on 9221's.

Configuration Limitations:

- Maximum number of #6150 per IBM 9221 processor is one
- STA is available only in ESA/390 capable 9221 models

- STA must be installed in card slot 15 in the CEC cage, hence reducing the number of card slots for the channels (CHPID′s 2C, 2D, and 2E are no longer available if FC6150 is installed).

ES/9000 9121 Air Cooled Frame Processor

Feature Code 6150 allows attachment of the Sysplex Timer on the 9121 uniprocessor, dyadic, and A-Side of a 9121 multiprocessor. ***Feature Code 6151*** allows attachment of the Sysplex Timer on the B-Side of a 9121 multiprocessor. When ordering the Sysplex Timer Attachment for a multiprocessor, both sides must have an attachment feature.

ES/9000 9021 Water Cooled Processor

Feature Code 4501 allows attachment of the Sysplex Timer on the 9021 uniprocessor, dyadic, triadic, quadradic, and A-Side of a 9021 multiprocessor. ***Feature Code 5501*** allows attachment of the Sysplex Timer on the B-Side of a 9021 multiprocessor. When ordering the Sysplex Timer Attachment for a multiprocessor, both sides must have an attachment feature.

FC4501 (A-side) is mutually exclusive with RPQ 8P1189 for TPF.

FC5501 (B-side) is mutually exclusive with RPQ 8P1269 for TPF.

ES/3090 Water Cooled Processor

The following IBM ES/3090 processors are supported:

- 180J
- 200J
- 280J
- 300J
- 380J
- 400J
- 500J
- 600J
- ES/3090-9000T (all models)

ES/3090′s must have SEC 227574 if the 9037 is below SEC C65184 or C65184A. If the 9037 is at SEC C65184 or C65184A or higher, then the 3090 must be at SEC 227576 or higher.

Feature Code 4501 allows attachment of the Sysplex Timer on the ES/3090 uniprocessor, dyadic, triadic, and A-Side of an ES/3090 multiprocessor. ***Feature Code 5501*** allows attachment of the Sysplex Timer on the B-Side of a 3090 multiprocessor. When ordering the Sysplex Timer Attachment for a multiprocessor, both sides must have an attachment feature.

FC4501 (A-side) is mutually exclusive with RPQ 8P1189 for TPF.

FC5501 (B-side) is mutually exclusive with RPQ 8P1269 for TPF.

9672 S/390 Parallel Transaction Server

Depending on the 9672 model (E01, E02, E03, E04, E05, E06, E07, E08, P01, P02, P03) and their features, there can be a string of frames. The first two CEC cages in a string must each have a Sysplex Timer Attachment Feature provided by ***Feature Code 6150***. This feature is known as the ***MASTER card*** and is used to connect to the 9037 Sysplex Timer.

A string of eight CECs requires only two inputs to the 9037 sysplex timer.

When more than one FC6150 is available, it is recommended that the 9037 Expanded Availability configuration be used. Each CEC should be attached to different 9037s for redundancy. FC6150 has one fiber port.

Feature Code 6151 is required in the third through eighth CECs in a string and is driven by the sysplex timer attachment FC6150s located in the first two CECs. This feature is known as the ***SLAVE card***.

RPQ 8P1656 Dual Port Card

"WITHDRAWN"

RPQ 8P1656 provided for the installation of Feature Code 6152 (Dual Port ETR Card) on single CEC, 9672 Parallel Transaction Server model E01 or P01. This RPQ allowed the model E01 or P01 to have two attachment ports to the Sysplex Timer.

The 9672 E01 and P01 may now be ordered with either FC6150 (Master Card) or FC6152 (Dual Port card). Therefore the RPQ is no longer needed.

Master Card

Each Master card has two input ports and one output port. The master input port is a fiber optic port, which is attached to a 9037 Sysplex Timer through a fiber optic cable. The slave input port is an electrical port, which receives re-driven 9037 signals from the other Master card's output port. In an Expanded Availability 9037 configuration, each Master card should be attached to a different 9037. The Master card's output port distributes the 9037 signals to the other Master card and all the slave cards in the string.

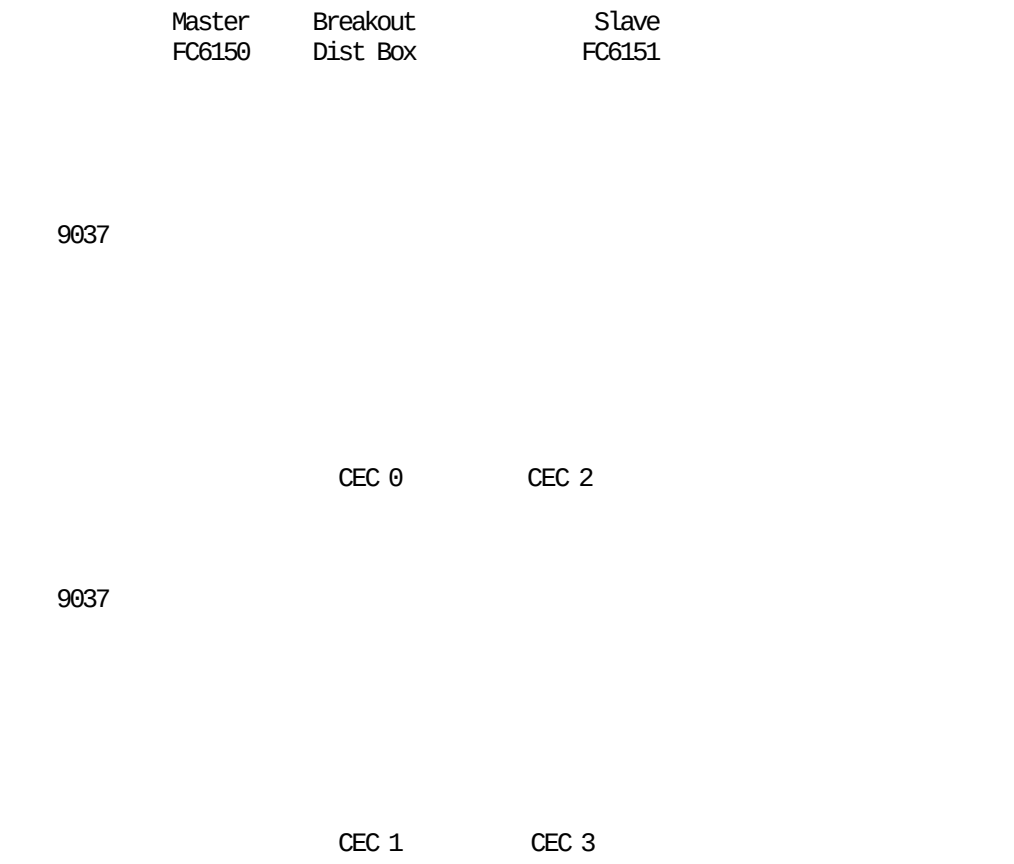
One master card is always found in slot 16 of the CPC at location A18A (upper location in frame A). The master output port of this card is connected to the upper distribution block in frame A.

In a repair procedure, this master card is referred to as the first master card and this distribution block is referred to as the first distribution block.

Because of the different system configurations possible, the second master card can be found in slot 16 of the CPC at location A01A, Z18A, or Y18A. The master output port of this card is connected to the distribution block in the same frame as it is located. In a repair procedure, this master card is referred to as the second master card and this distribution block is referred to as the second distribution block.

Slave Card

This card is used for 9672 models that have more than two CECs and is installed in the third through eighth CEC in each string. Each Slave card has two electrical input ports, each receiving signals from a different Master card's output port. The Slave card does not have any output ports to redistribute the 9037 signals and is always found in slot 16 of the CPC.



This is a diagram of a 9672-E04. CEC-0 and CEC-1 contain FC6150 (Master Sysplex Timer Cards) plus a Breakout Distribution Box. FC6151 (Slave Sysplex Timer Cards) are installed in all subsequent CECs in the string.

The Distribution Block distributes Sysplex Timer signals to the Slave cards and the other Master Card.

Warning: If both CEC-0 and CEC-1 are deactivated, there are no Sysplex Timer paths to CEC-2, CEC-3, or any subsequent CECs in the string.

Figure 11. 9672-E04 to 9037 Sysplex Timer Attachment Diagram (FC6150/FC6151)

9672 S/390 Parallel Enterprise Server

Feature Code 6152 provides the attachment of the Sysplex Timer and provides a dual port capability to allow redundant ports. You may attach either one or two Sysplex Timers to this card.

The card has two fiber optic ports, each of which is attached to a 9037 Sysplex Timer through fiber optic cable. In an Expanded Availability 9037 configuration, each fiber optic port should be attached to a different 9037.

This card does not have any ports to redistribute the 9037 signals to other CECs as in FC6150. FC6152 is located in slot 16 of the CEC at location A18A (upper location in frame A).

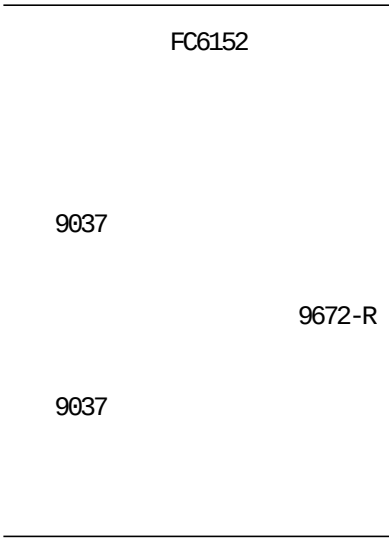


Figure 12. 9672-R to 9037 Sysplex Timer Attachment Diagram

9672 S/390 Parallel Enterprise Server (Models Rx2 and Rx3)

The 9672 Rx2 and Rx3 models may be ordered with either FC6150 (Master card) or FC6152 (Dual Port card).

FC6152 Dual Port

FC6152 on the 9672 Rx2 or Rx3 models have the same characteristics as FC6152 on the 9672-Rx1 models. Two fiber optic paths are connected to the Sysplex Timer network. Each path should be connected to a separate 9037 configured in an Expanded Availability configuration providing redundant paths to a single CEC.

Since the 9672 Rx2 and Rx3 are stand-alone systems (CEC's are not bolted together), FC6152 (Dual Port card) clearly provides enhanced Sysplex Timer availability when there are no other 9672 Rx2 or Rx3 models in the Sysplex Timer network.

FC6150 Master Card

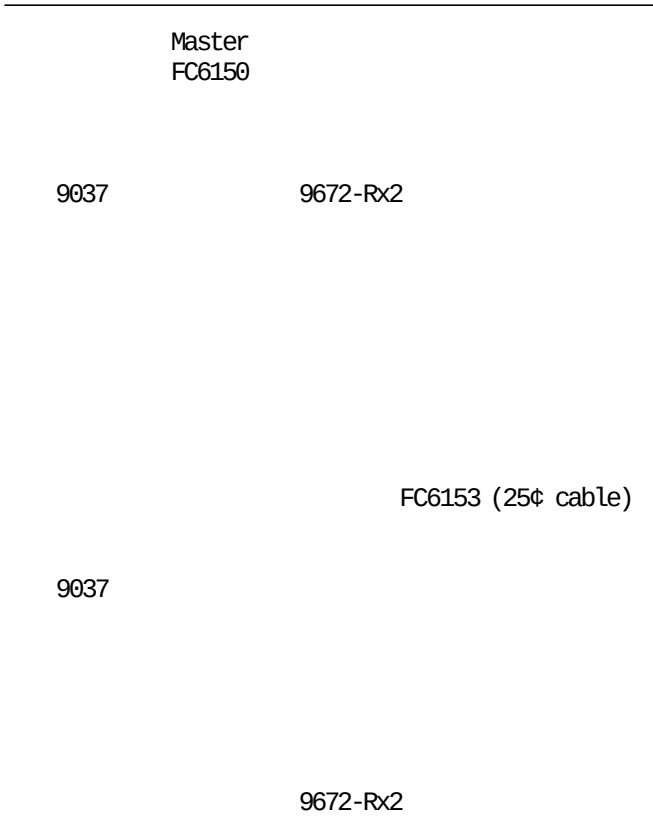
FC6150 on the 9672 Rx2 or Rx3 models have similar characteristics of FC6150 on the 9672-E or P models.

Each FC6150 has ONE fiber optic port providing a connection to a Sysplex Timer. FC6150 also has two electrical ports. One electrical port sends the Sysplex Timer signals to another CEC containing a FC6150 Master Card. The other electrical port accepts the Sysplex Timer signals from another CEC containing a FC6150 Master Card.

The electrical signals are carried by an optional, external cable (FC6153).

FC6153

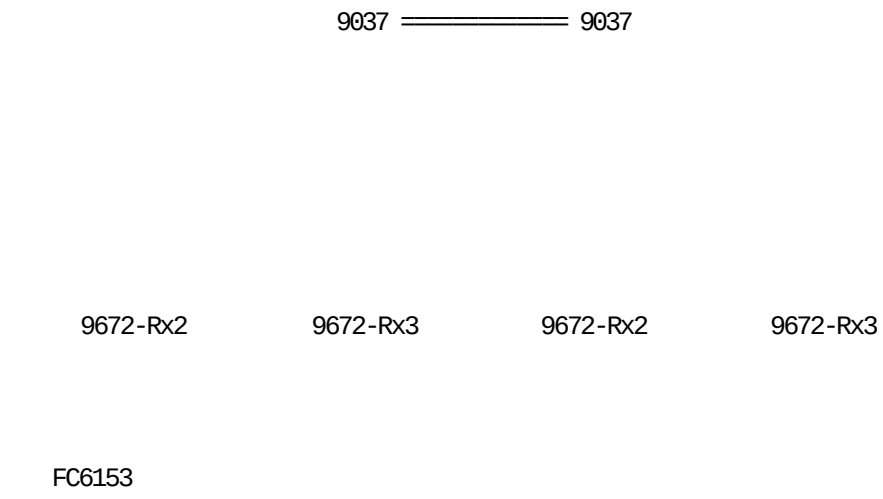
This cable allows for redundant Sysplex Timer paths to a pair CECs, but uses only one optical cable per CEC. This reduces the number of required fiber optic cables. Two CECs can ″share″ two fiber optic cables. Today, a Sysplex is capable of running with 32 MVS/ESA CECs and the 9037 Expanded Availability configuration supports up to 32 ports. FC6153 enables 32 Sysplex Timer ports to *″redundantly″* support up to 32 CECs.



The cables are routed under the floor between the two CEC′s. The cable length is approximately 25 feet.

Each 9672 Rx2 or Rx3 CEC with FC6150 (master card) may order one FC6153 cable.

Figure 13. Two 9672-Rx2 CEC′s with FC6150 and FC6153



This diagram shows four fiber optic Sysplex Timer cables providing *redundant* paths to four CECs through the use of FC6153. If there were a 9037 failure, each CEC can continue to receive Sysplex Timer signals.

Figure 14. Four 9672 CEC's with FC6150 and FC6153

9673 S/390 Parallel Query Server

Installation of the 9673 S/390 Parallel Query Server (SPQS) is a standard support service included with the S/390 Parallel Query Server solution. A Sysplex Timer and its installation is included with the SPQS package.

9674 S/390 Coupling Facility

The 9674 Coupling Facility does not require a connection to the Sysplex Timer, therefore no Sysplex Timer card is available.

Miscellaneous Physical Installation Tips

Some things to know and consider regarding installation of the 9037 are...

1. If you are installing an Expanded Availability configuration (two 9037s), it is recommended that a separate ac power source be used for each 9037. The console can share the same ac power source with one of the 9037s.
2. If you will be dialing out to an external time source with the console modem, you should plan to have the phone line installed up to one month before the Sysplex Timer installation. This allows time for schedule slippage due to possible phone company delays. Also, if you plan to use an external modem, install the modem prior to installing the 9037 if possible.
3. It is possible to use an external time source before the 9037 is attached to a processor. This allows you to set the time in the 9037 in advance and become familiar with the console user interface.
4. The 9037 will ship with two copies of the operational diskette. The IBM Service Representative should give one copy to the customer to be used as a backup copy.
5. Decide if you want to restrict access to the 9037 via a password. This is an option which you may or may not want to implement. Handle the distribution and protection of the password as appropriate for your site. *Implementing password protection is recommended.*
6. Each 9037 at your site will be given a separate address by the IBM Service Representative during the normal installation setup. They are made via dip-switches inside the 9037. The addresses are strictly arbitrary and have no significance regarding IOCP. If the Service Representative asks you what addresses to use, you may choose any two digit numbers between 00-15. The 9037 addresses are used by the 9037 to help distinguish which 9037 generates messages on the 9037 log and by the SCP to verify the configuration.
7. If your mainframe is being upgraded to add the Sysplex Timer Attachment Feature, an outage will be required.
8. If your machine is a multiprocessor (MP), both sides must install a Sysplex Timer Attachment Feature.

Sample Planning Checklists

The following tables are sample installation checklists.

1. Operating the 9037, (Table 10 on page 49).
2. Software, (Table 11 on page 49)
3. Hardware and Physical Planning, (Table 12 on page 49)

Table 10. Operating the 9037

Activity	Task Owner	Due Date	Comments
Determine if 9037 console password will be used.			Add to security guidelines documentation.
Introduce operators to SETETR and DISPLAY ETR commands.			
Determine Daylight Savings Time change procedures.			Update operator documentation.
Introduce staff to 9037 console screens.			See Chapter 5, “Operating the Sysplex Timer” on page 53.
Introduce staff to 9037 recovery concepts and messages.			See Chapter 8, “Recovery” on page 97 and Table 17 on page 117.

Table 11. Software

Activity	Task Owner	Due Date	Comments
Make necessary updates to SYS1.PARMLIB(CLOCKxx) member.			See “MVS/ESA” on page 11.
Install PTF′s if appropriate.			See Table 1 on page 17.

Table 12 (Page 1 of 2). Hardware and Physical Planning

Activity	Task Owner	Due Date	Comments
Obtain a table or tables.			The 9037 is designed to sit on a table. Multiple 9037s should not be stacked, but the console may sit on top of a 9037 if required.
Install power circuits.			If more than one 9037, consider separate power circuits for availability. The 9037 console can share the same circuit with one of the 9037s.

Table 12 (Page 2 of 2). Hardware and Physical Planning			
Obtain a modem (optional)			A modem is required if the user intends to dial-out to ACTS. See "Modem" on page 37 and Figure 10 on page 39.
Obtain a phone line for modem			If dialing to ACTS.
Order/deliver fiber optic cables			These cables are purchased by the customer separately. Plan to have them arrive and laid out before the Sysplex Timer delivery. See "Cables" on page 30.
Install appropriate System Engineering Change (SEC) on processor if required.			See Table 8 on page 40.
Order the Sysplex Timer.			Use the HONE configurator.
Order the Sysplex Timer Attachment Facility			If a multiprocessor, you must order for both sides.
Install Sysplex Timer Attachment Facility or ETR Card for your processor/server.			See "Required Processor/Server Outages" on page 41. ***This step requires a processor/server outage.***

Request for Price Quotation (RPQ)

A Request for Price Quotation (RPQ), via the HONE RPQ application, is the process used by IBM to establish the availability of, and charge for, a non-standard machine, machine feature, program, or function.

An RPQ request is the document submitted by a Branch Office to Special Product Marketing (SPM), to REQUEST a new product or function.

The term ″RPQ″ is sometimes used generically to describe various documents and procedures within the RPQ process. In its strictest definition, Request for Price Quotation describes the actual request initiated by the Branch Office.

The IBM 9037 Sysplex Timer has had RPQs submitted which have been approved and are generally available to customers when required. These RPQs are mentioned throughout this document where appropriate. They are:

- 8K1787 (Basic Mode ETS Tracking) on page 6
- 8K1903 (9037 RPQ Pointer to 8K1919) on page 33
- 8K1919 (9036 Extended Distance) on page 33
- 8K1731 (TOD Sync Compatibility (TSC for TPF)) on page 21
- 8P1656 (Dual Port Card) on page 43.

Upgrades

Sysplex Timers may be upgraded in the field either by adding a second 9037 (Expanded Availability) or by adding ports as needed (in groups of four).

Upgrading from a Basic to an Expanded Availability configuration is always a disruptive process.

Adding ports to a Basic 9037 configuration is also disruptive.

Non Disruptive Port Upgrades

If you are running in a properly connected Expanded Availability configuration, it is possible to add ports to the 9037s without disruption to running systems. In Figure 4 on page 26, two 9037s are used to provide redundancy. Lets call them 9037-A and 9037-B. The steps needed to remove one at a time for port upgrades might look something like this...

1. Verify redundant connectivity to both 9037s for each image. Are all ports enabled? Is the cabling done correctly? If not, correct the problem before continuing.
2. Power off 9037-B
   - MVS will receive messages that there was a 9037 failure (IEA262I and IEA272I RC76).
3. Upgrade 9037-B
4. Power on 9037-B
5. Enable 9037-B ports via 9037 console
   - Ensure that 9037-B ports are available by entering DISPLAY ETR,DATA from the MVS console.
6. Power off 9037-A
   - MVS will receive messages that there was a 9037 failure (IEA262I and IEA272I RC76) and the processor(s) will switch automatically to 9037-B.
7. Upgrade 9037-A
8. Power on 9037-A
9. Enable 9037-A ports via 9037 console

You are now back where you started with two 9037s available.

This procedure can also be used as a guide if concurrent maintenance is needed.

Chapter 5. Operating the Sysplex Timer

The Sysplex Timer Console software is very easy to use and intuitive for Personal Computer users that are familiar with pull-down menus. Extensive help is provided on every panel.

There are six pull-down menu options which allow you to perform various tasks and for displaying status or log information. These are:

- TIME - Figure 16 on page 54
- PORTS - Figure 22 on page 61
- PROFILE - Figure 24 on page 63
- LOG - Figure 28 on page 68
- MAINTENANCE - Figure 30 on page 71
- HELP - Figure 34 on page 75.

Main Menu

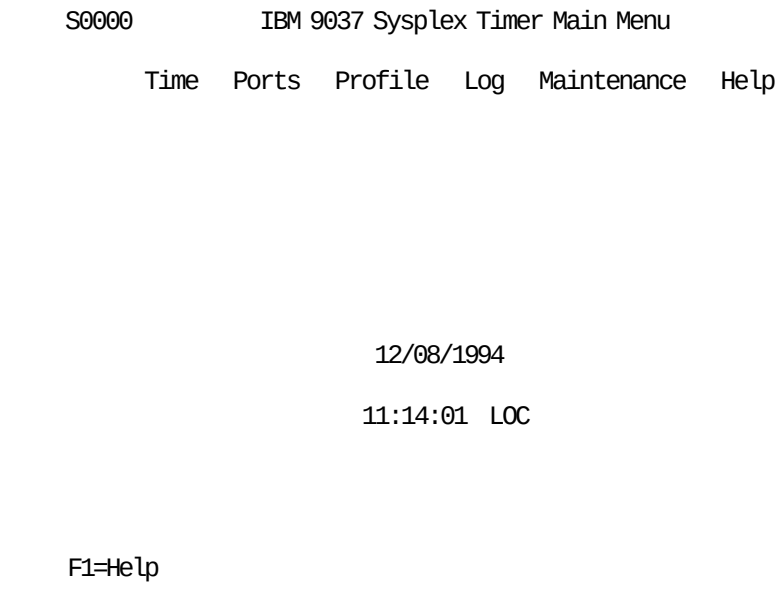


Figure 15. Main Menu

From the Main Menu, simply use the TAB key to highlight the area around the pull-down menu that you're interested in.

Time Pull-Down

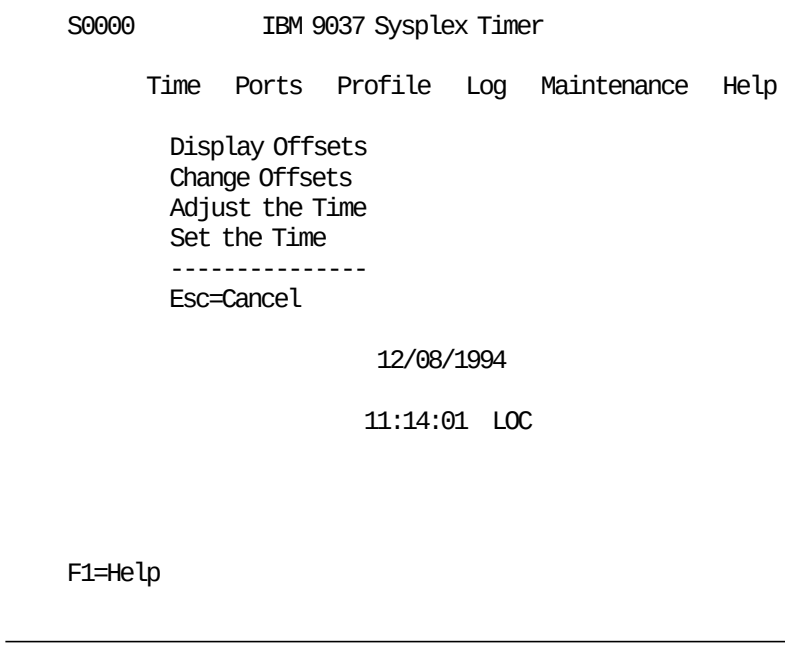


Figure 16. Time Pull-Down

The Time pull-down allows you to perform the tasks shown. Remember that **Set the Time** initializes (or power-on-resets) the Sysplex Timer and is disruptive to all attached processors.

The TIME pull-down menu panels follow.

Display Offsets

```
S1100                  Display Offsets                  11:13:47

 Changes are not allowed from this screen.

 Current Offsets:
   Leap Seconds . . . . . . . . . . . . . . (+/-) + 00:00:00
   Daylight Savings Time  . . . . . . . . . (+/-) + 00:00:00
   Time Zone  . . . . . . . . . . . . . . . (+/-) - 05:00:00

 New Offsets:
   Leap Seconds . . . . . . . . . . . . . . (+/-) + 00:00:00
   Daylight Savings Time  . . . . . . . . . (+/-) + 00:00:00

 Offset Change Schedule:
   Leap Seconds . . . . . . . . .__/__/____ (+/-) + 00:00:00
   Daylight Savings Time  . . . .__/__/____ (+/-) + 00:00:00
                                 MM/DD/YYYY


F1=Help   F3=Exit
```

Figure 17. Display Offsets

Display Offsets is not disruptive in any way since no changes can be made here.

Change Offsets

```
S1200                    Change Offsets                    11:14:27

 Fill in all data fields, then press enter.

 Current Offsets:
   Leap Seconds . . . . . . . . . . . . . . (+/-) + 00:00:00
   Daylight Savings Time  . . . . . . . . . (+/-) + 00:00:00
   Time Zone  . . . . . . . . . . . . . . . (+/-) - 05:00:00

 New Offsets:
   Leap Seconds . . . . . . . . . . . . . . (+/-) + 00:00:00
   Daylight Savings Time  . . . . . . . . . (+/-) + 00:00:00

 Offset Change Schedule:
   Leap Seconds . . . . . . . . .__/__/____ (+/-) + 00:00:00
   Daylight Savings Time  . . . .__/__/____ (+/-) + 00:00:00
                                 MM/DD/YYYY


F1=Help   F3=Exit
```

Figure 18. Change Offsets

Change Offsets allows you to have the Sysplex Timer schedule an offset or enter a new offset to execute immediately. If the MVS SYS1.PARMLIB(CLOCKxx) has ETRZONE YES specified, then MVS will change its offset based on the settings from this screen.

The Leap Seconds represent the difference between UTC and Absolute time.

Daylight Savings Time is usually **00:00:00** when DST is not in effect, and some positive value **(01:00:00)** during DST.

If scheduling an offset change, the New Offset becomes the current offset at the scheduled time. If the Schedule area is blank, then no offset change is scheduled.

Adjust the Time

```
S1300                    Adjust the Time                    11:15:49

  Fill in the Adjustment Amount or press F6 to calculate the
  adjustment using an External Time Source. Press Enter to
  apply the adjustment.

  The Adjustment Amount is expressed in seconds and partial
  seconds. The maximum allowed is +/- 4.999 seconds. Enter a
  positive value if the 9037 is running slow, or a negative
  value if the 9037 is running fast.

  The currently displayed Adjustment Amount reflects any
  adjustment in progress.

  Adjustment Amount . . . . . . . . . . . . . .  (+/-) + 1.987

Note: Adjustments are only valid in the Expanded Availability
      configuration. Adjustments have no effect in a Basic
      configuration without RPQ 8K1787.

F1=Help F3=Exit F4=Refresh F6=Calculate Adjustment F9=Details
```

Figure 19. Adjust the Time

Small adjustments can be made to the 9037 time without having to reinitialize the 9037 configuration (without doing Set the Time). The adjustment rate is approximately 12 hours for each second of adjustment. The actual time required to complete an adjustment can vary and depends on internal tolerances.

By pressing F6, the 9037 time will be compared to the External Time Source time. The adjustment field will be filled in with the adjustment required to synchronize the 9037 with the External Time Source. If this is an Expanded Availability configuration or a Basic configuration with RPQ 8K1787, you may press enter to apply the adjustment.

If you are within tracking range then adjustments between ACTS and the 9037 will be handled automatically. If your 9037 time is beyond ± 4.999 seconds of ACTS, then the new External Time Source timestamp will not be accepted. If this happens, you may manually adjust the time (in increments of 4.999 seconds or less) until you are again within tracking range. After that, the automatic dial-out and adjustment capability can again be used.

Calculate Adjustment

```
S1310              External Time Source              11:16:43
                       Detailed Status


When last compared:

  The external time source time was ..........:

  The Sysplex Timer time was .................:

  Time difference (in seconds) ...............:  0.0000


  Actual data returned by the external time source is
  listed below:
         ¢¢
         ¢¢
         ¢¢


F1=Help F3=Exit
```

Figure 20. External Time Source

This panel is a result of hitting F9 (Details) in the previous panel. It shows the external time source timestamp value and compares it with the current 9037 timestamp.

Successful dial-out?

If you have set up the 9037 to periodically dial-out to ACTS, there is no indication in the 9037 Log of a successful connection.

Return Code (RC042) indicates that the 9037 is tracking the External Time Source, but this is misleading. RC042 only means that the 9037 console has been configured to dial-out and the initial dial-out was successful. There won't be a RC042 for subsequent dial-outs.

To determine if there was a successful dial-out, select the ADJUST THE TIME menu, then select the F9=Details key. The Detailed Status panel will list the exact time of the most recent dial-out and any adjustment that was needed.

Set the Time

```
S1400                    Set the Time                    11:17:07

First, fill in the Network Address and the Time Offsets,
then to set the time, either enter the Current Date and Time
and press Enter, or fill in just the Year and press F6 to
obtain time from an External Time Source.

Network Address . . . . . . . . . . . . . . . . . . . . 00
 NOTE: The Network Address must be UNIQUE to this 9037 cnfg.

Time Offsets:
  Leap Seconds . . . . . . . . . . . . .  (+/-) + 00:00:00
  Time Zone  . . . . . . . . . . . . . .  (+/-) - 05:00:00
  Daylight Savings Time  . . . . . . . .  (+/-) - 00:00:00

Current Date and Time . . . . . . . .  12/08/1994 11:17:07


F1=Help   F3=Exit   F6=External Time Source
```

Figure 21. Set the Time

This panel is used to set the time in the Sysplex Timer. When completed, the attached CPC TOD clocks will be synchronized to the same time value. Enter the current date and time plus the appropriate offsets.

A warning message similar to the box below is first displayed when this panel is accessed.

Warning! Warning! Warning!

A re-IPL of all attached Sysplex processor complexes may be required if changes are made to this panel.

This panel must ONLY be used to initialize the 9037(s). To make minor corrections to the time or to change time offsets, use the ADJUST THE TIME and CHANGE OFFSETS panels. ***To safely exit this panel: Press F3 to clear this message and F3 again to exit the panel.***

Pressing ENTER from this panel will send initialization data to the 9037 unit(s). The ENTER KEY on the PC may be mistaken for a 3270 TSO session TAB KEY, so use caution.

During this operation, the 9037(s) will Power-On-Reset. Processors attached to the 9037 ports will lose the 9037 timing signals until the Power-On-Reset is complete.

If the attached processors are members of a Sysplex then SETTING THE TIME on the Sysplex Timer will cause a loss of Sysplex Timer signals. This is considered a Sysplex Timer failure by the Sysplex members and will result in X'0A2' wait states which may require a re-IPL of all Sysplex members. See "Sysplex Timer

Problems (in a Sysplex)” on page 98 in the Recovery chapter of this book for detailed explanations of 9037 failures.

Network Address

The Network Address is used to uniquely identify your 9037 configuration. The address can be any number between 00-31.

At 9037 IPL time, the value selected is stored into memory for subsequent use. When the Network Address is set or changed the 9037 stops transmitting to the attached CPCs.

Ports Pull-Down

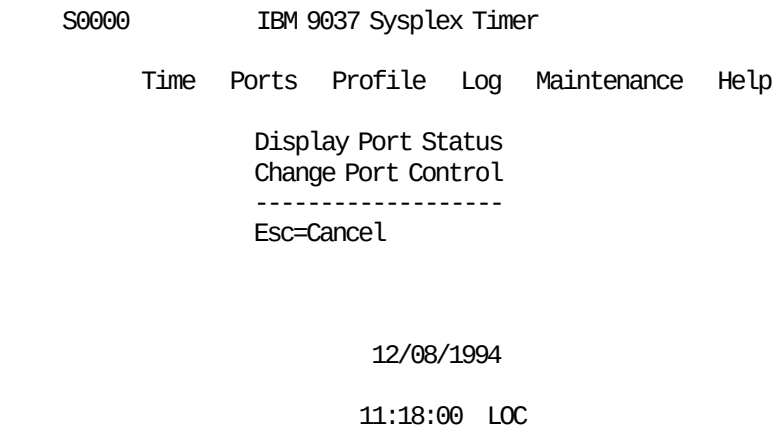


Figure 22. Ports Pull-Down

The Ports pull-down allows you to perform the tasks shown. The DISPLAY PORTS STATUS panel won't allow you to make any changes to the configuration. The DISPLAY PORTS STATUS and the CHANGE PORTS CONTROL panels look alike so only the Change Ports panel will be shown.

The CHANGE PORTS CONTROL panel follows.

Change Port Control

```
S2100                  Change Port Control                  11:20:46

Position the cursor under the port to be controlled,then
press the space bar to toggle the control on or off. Press
Enter to send changes to the 9037 units.

Unit Address: 10
    Port:    00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
             ---------- ---------- ---------- ----------
  Status:     ›  ›  ›  ›  _  _  _  _  _  _  _  _  _  _  _  _

 Control:     ›  ›  ›  ›  o  o  o  o  o  o  o  o  o  o  o  o

Unit Address: __
    Port:    00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
             ---------- ---------- ---------- ----------
  Status:     _  _  _  _  _  _  _  _  _  _  _  _  _  _  _  _

 Control:     o  o  o  o  o  o  o  o  o  o  o  o  o  o  o  o


Enter   F1=Help   F3=Exit   F4=Refresh
```

Figure 23. Change Port Control

The Status line indicates the current status of the ports. The Control line indicates the current control setting for the ports. The Unit Address identifies the 9037 unit. Each 9037 unit can have up to four port cards installed.

The control line port indicators can be switched (o = off, ↑ = on) by pressing the space bar on the keyboard. Once you have the control line set as desired, press enter. If the change is successful, the status line will be updated reflecting the new status.

In this example, only four ports on one 9037 are installed and transmitting normally, as indicated by the upward pointing arrow.

Other port status conditions are

- \- Not installed
- o Offline
- L Port receiver is not detecting light but port is transmitting (tuned)
- E Port receiver has detected an error (untuned)
- X Hardware failure. Port is off-line.

Profile Pull-Down

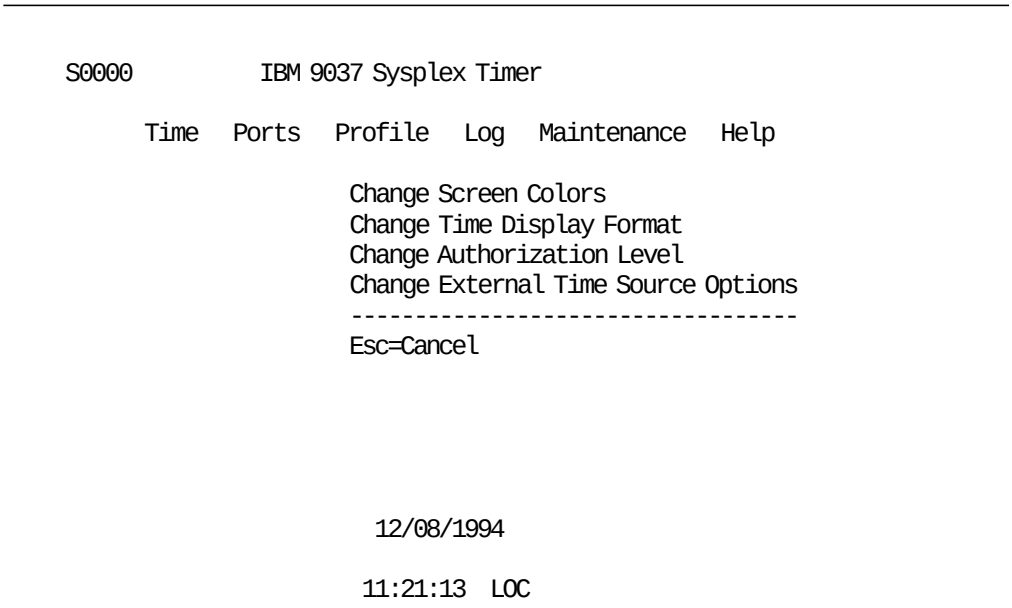


Figure 24. Profile Pull-Down

The Profile pull-down allows you to arrange the appearance of your console display in a way that best suits your tastes and requirements.

The PROFILE pull-down menu panels follow (with the exception of the change screen colors pull-down). The color panel allows you to customize the colors and appearance of the 9037 console screens.

Time Display Format

```
S3200                  Time Display Format          11:21:33

Select options, then press Enter.

Date format . . . . . . . . . . . . . . . . . . . .  1
   1. MM DD YYYY
   2. DD MM YYYY
   3. YYYY MM DD

Time format . . . . . . . . . . . . . . . . . . . .  2
   1. 12 hour
   2. 24 hour

Time Interpretation . . . . . . . . . . . . . . . .  1
   1. Local Time
   2. Coordinated Universal Time

Local Time Abbreviation  . . . . . . . . . . . . .   LOC
Coordinated Universal Time Abbreviation  . . . .   UTC
Date Separator . . . . . . . . . . . . . . . . . .   /
Time Separator . . . . . . . . . . . . . . . . . .   :


Enter   F1=Help   F3=Exit
```

Figure 25. Time Display Format

Modifying these values do not change the date or time in any way. Instead, these changes allow you to view the information on the display differently according to your preference. Use this screen to change how the time and date are displayed on the 9037 console. You can change the date and time formats, their separator characters, and the abbreviations displayed for Local Time and Universal Coordinated Time.

For simplicities sake, you may want ″Time Interpretation″ to display Local Time (option 1). Although the 9037 is most interested in UTC time, it will apply your time zone offset for you and display your local time on all of the 9037 console screens.

Warning

When you initially ″SET THE TIME″, you may enter it as either LOCAL time or UTC. Be sure that you know which way the TIME INTERPRETATION is set before you Set the Time!

Authorization Level

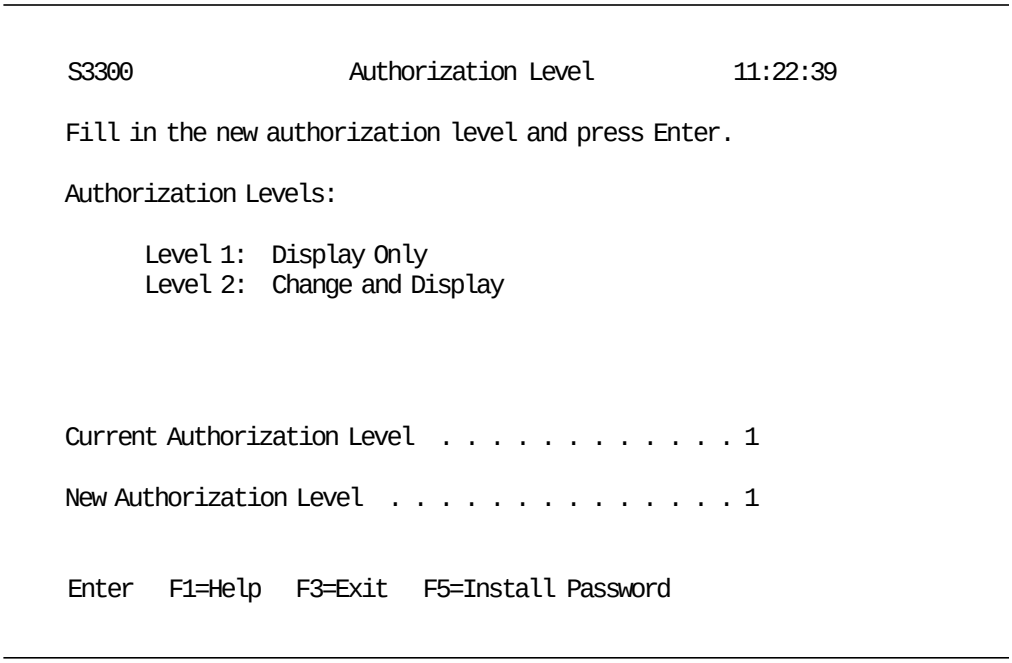


Figure 26. Authorization Level

Authorization levels and password protection are provided to prevent accidental or casual tampering of critical data. Before leaving the console unattended, the authorization level should be changed to 1.

The authorization level will remain in effect until changed or until the 9037 console is powered off. When powered on, the default is level 1.

All password-related activities (including failed attempts) are entered into the Event Log.

To install password protection, press F5 and enter the new password. The password can be a minimum of 1 and a maximum of 16 alphanumeric characters.

After password protection is installed:

The password, if used, is required to select authorization level 2.
Press F5 to remove password protection (current password is required).
Press F7 to change the password (current password is required).

Recommendations

1. When finished with Authorization Level 2, always reset your console to Authorization Level 1 before leaving the console unattended.
2. Implement password security.

Lost Password Procedure: A password retrieval procedure is provided, in the event that the password is lost or forgotten.

1. From the main menu screen with no pull-down windows active, the user enters Alt-P twice.
2. Password protection is removed from the console.
3. A password can now be set by performing the password procedure used at installation.
4. A ″password-removal″ entry will be made in the Event Log.

External Time Source Options

```
S3400          External Time Source Options        11:23:39

Select the desired options and press Enter.
Press F1 for additional information.
Authorization Levels:

External Time Source . . . . . . . . . . . . . . . . : 0
    0) None
    1) Modem  (ACTS)
    2) Receiver or Time Code Generator

Enable automatic adjustment  (0=No, 1=Yes) . . . . : 0

If you have selected ACTS as the External Time Source, you
must supply the Dialing Sequence. The Adjustment Interval
applies if you have selected ACTS and automatic adjustment.

Dialing Sequence  . . . . . .: ATDT9,1-303-494-4774_______

Adjustment Interval (Days, Hours) . . . . . .  : 007, 00


Enter   F1=Help   F3=Exit
```

Figure 27. External Time Source Options

The 9037 can be synchronized to one of several sources.

- The Automated Computer Time Service (ACTS), provided by the National Institute of Standards and Technology (NIST) in Boulder, Colorado, can be accessed via the consoles internal modem or a modem attached to the consoles EIA-232 serial port.
- A WWVB radio receiver or a GPS satellite receiver may be attached to the EIA-232 serial port on the console.
- A time code generator may be attached to the EIA-232 serial port.

The help panels (F1) will provide more details on the available options and how to set up the dialing sequence.

LOG Pull-Down

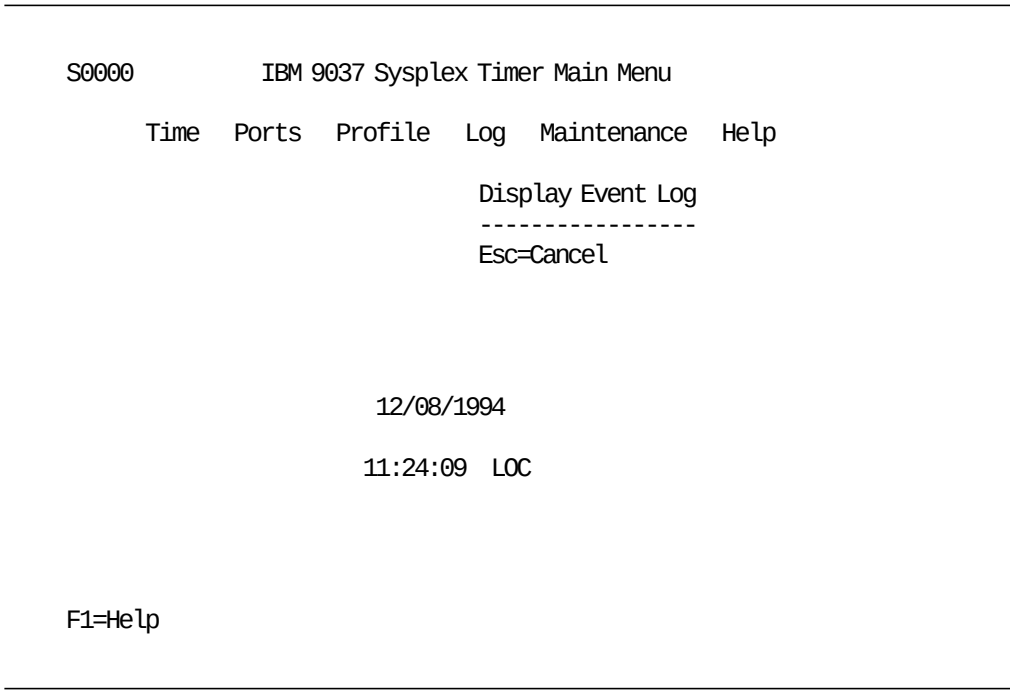


Figure 28. LOG Pull-Down

From here, you can view the 9037 Event Log.

An example of the Event Log follows.

Display Event Log

```
S4100                    Event Log                    11:24:21

12/02/1994 09:48:26  LOC  Audit Trail.
    RC141  Time adjustment set.

12/02/1994 09:49:14  LOC  Audit Trail.
    RC140  Authorization level changed.

12/08/1994 11:01:22  LOC  Audit Trail.
    RC140  Authorization level changed.

12/08/1994 11:01:40  LOC  Audit Trail.
    RC130  Offset schedule changed.

12/08/1994 11:23:49  LOC  Audit Trail.
    RC140  Authorization level changed.

12/08/1994 11:26:00  LOC  Audit Trail.
    RC001  Log Marker. ------------------------------ 001



F1=Help  F3=Exit  F4=Refresh  F5=Mark Log
```

Figure 29. Display Event Log

The event log is maintained as a list of events. As log entries are created, they are added to the bottom of the list. When the log is first displayed, you will be at the bottom of the list, with the most recent event at the bottom of the screen.

If there are more than six entries, 'More' is displayed in the upper right corner and the Up and Down arrow keys or the PgUp and PgDn keys can be used to scroll the log entries. The log can contain the last 400 events.

Each log entry consists of two lines:

- Line 1:

  First on the line is the time stamp for the entry. If the console is not attached to fully functional units, the time stamp will be expressed in UTC. When the 9037 units are operating normally, the time format will be as specified in the Time Display Profile.

  The Time Stamp is followed by either the unit address of the 9037 which originated the message or the words Audit Trail for messages originating from the 9037 console.

- Line 2:

  Reason Code Number and a short description.

When potential error conditions are logged, special 'Diagnostic Data' entries may be created. The Diagnostic Data is intended for specialized problem determination and should be ignored by the user.

F5 will insert a ′log marker′ entry following the last event record. It is always a good idea to mark the log as a final step when leaving the console unattended. When you return, you will know which events have occurred since you last viewed the log.

A message will be displayed on the main panel whenever new entries have been posted to the log.

Maintenance Pull-Down

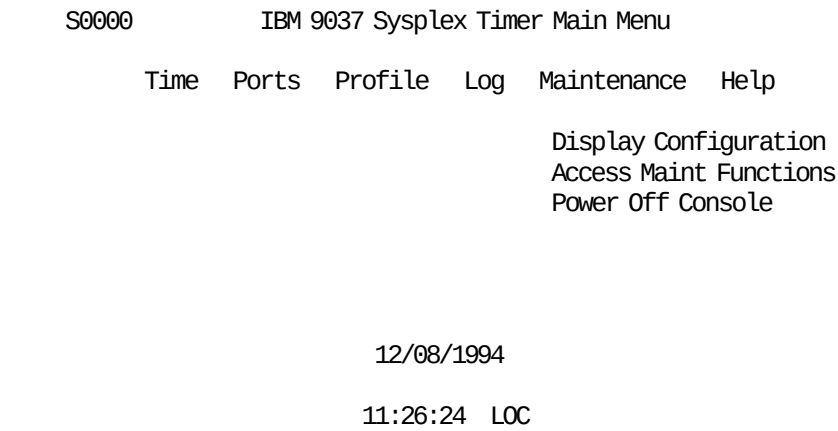


Figure 30. Maintenance Pull-Down

There is really no reason for a customer to use the Maintenance panels. The Display Configuration panel is for assisting the CE to determine what's configured and where a problem might be.

Entering Access Maintenance Functions may be ***hazardous,*** so it's best to stay clear.

Powering off the console is safe to do, but it too is an occasion when an IBM Service Representative should be present. The console should be left up and running at all times if possible, so it can record events and perform scheduled offset changes.

The Maintenance pull-down menus follow.

Display Configuration

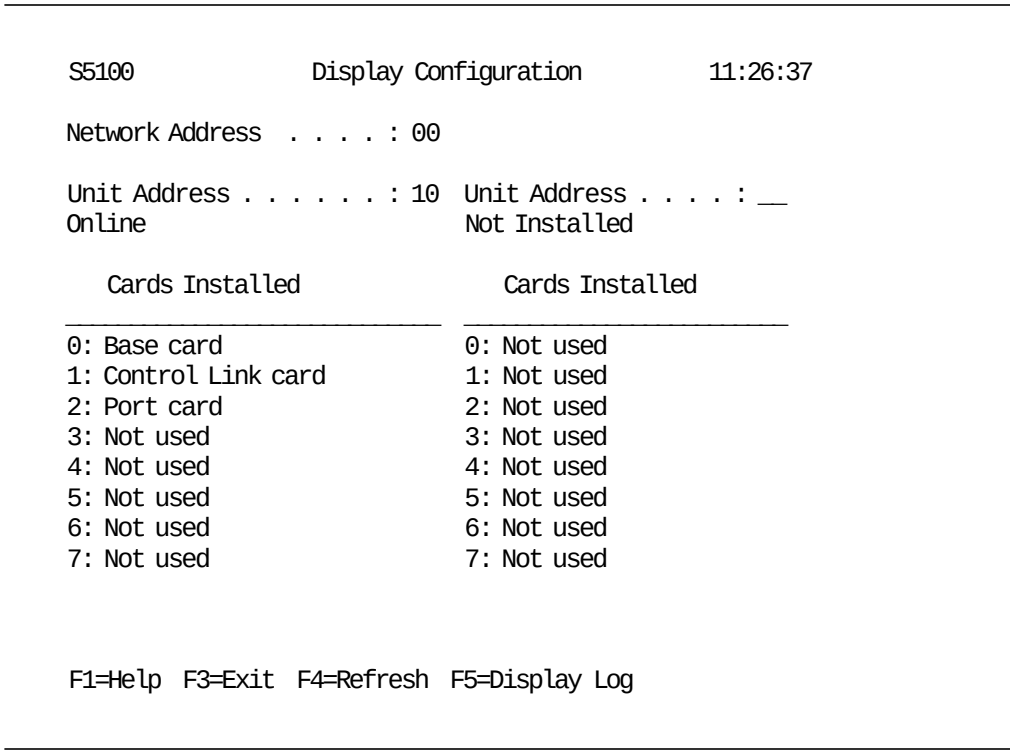


Figure 31. Display Configuration

This screen displays the 9037 configuration.

Maintenance

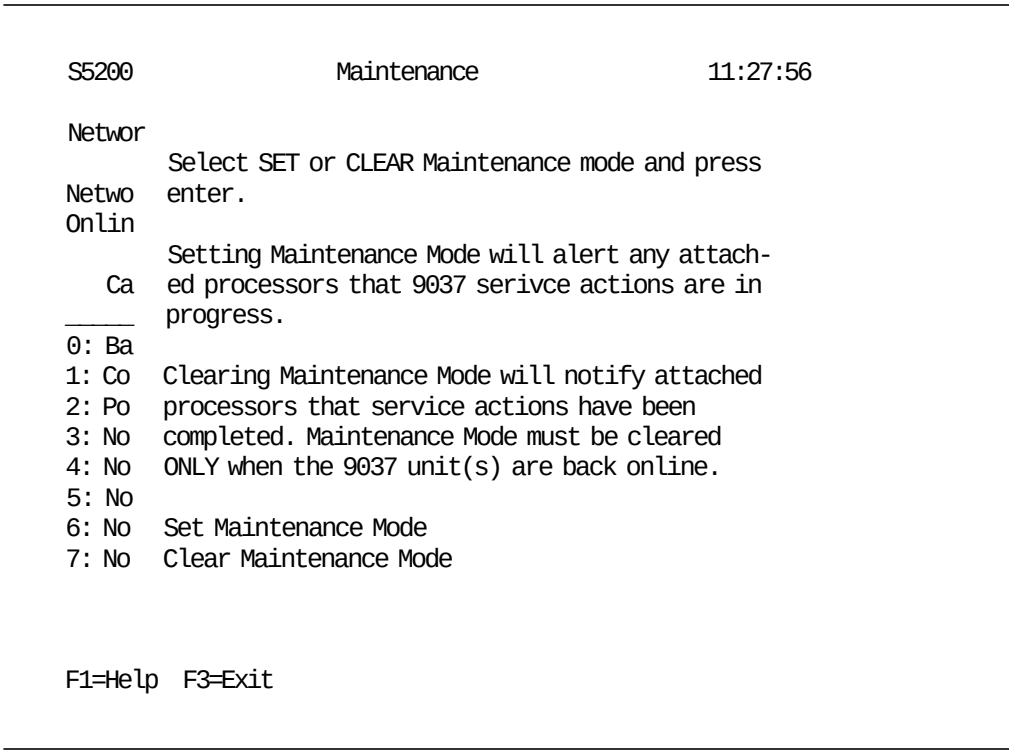


Figure 32. Maintenance

Leave this screen alone. It is for IBM Service personnel only.

Power Off Console

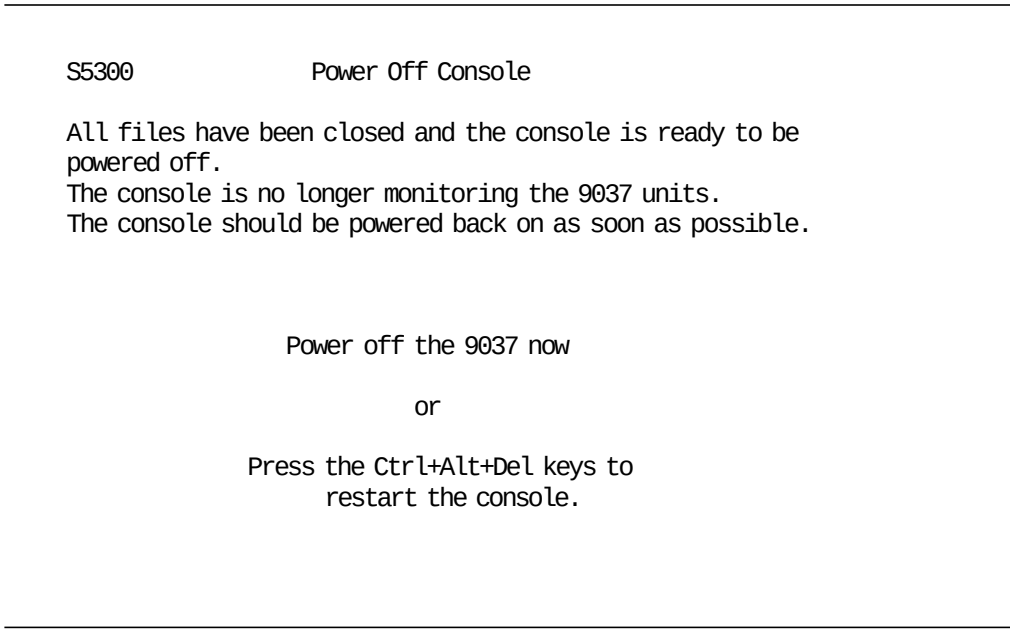


Figure 33. Power Off Console

The 9037s can still transmit to the processors while the console is powered off, but it's best to leave the console online at all times if possible.

If the console is powered down, the External Time Source options cannot function.

Help

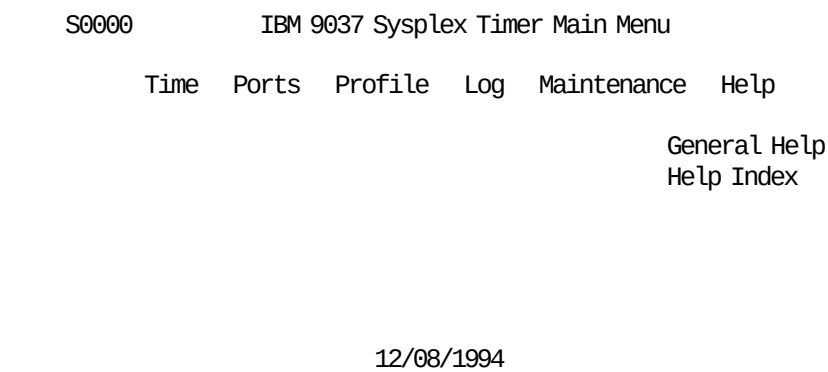


Figure 34. Help

From the Main Menu, simply use the TAB key to highlight the area around the pull-down menu that you're interested in.

Figure 35 on page 76 and Figure 36 on page 77 display the General Help and Help Index displays, respectively.

General Help

```
                          General Help

At the Main Menu:
  Use the left and right arrow keys to position the cursor,
  then press Enter to select an option.

At any help window:
  Use the up and down arrow keys to scroll one line at a
  time. Use the PgUp/PgDn keys to scroll one screen at a
  time.

At the pull-down menu:
  Use the up and down arrow keys to position the cursor,
  then press Enter to select an option. Use the left and
  right arrow keys to move between pull-down menus.

At any data screen:
  Follow the instructions for each screen.
  Press F1 for additional information.
  For most input fields:
    Press Alt and v to display the valid characters.
    Press Alt and r to display the range of values.

F3=Exit  F9=Help Index
```

Figure 35. General Help

Help Index

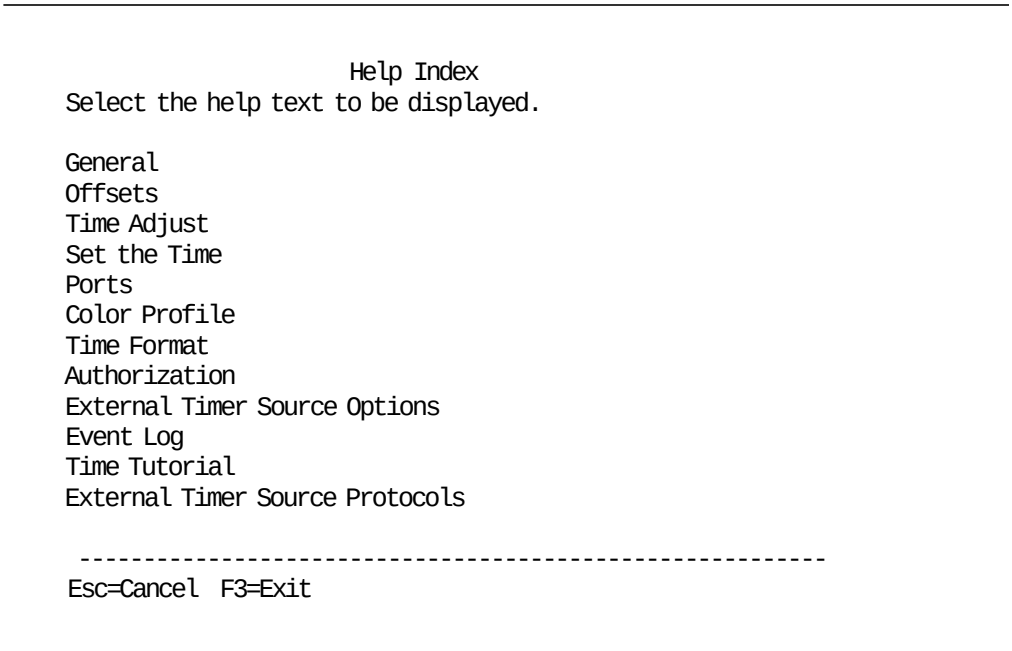


Figure 36. Help Index

These helps screens have a wealth of information. You should take the time to read them.

Chapter 6. Attaching the Sysplex Timer to the Processor

This chapter examines what to expect when you attach the Sysplex Timer in both Basic Mode and LPAR Mode.

First, review the cabling diagrams shown in Chapter 4, “Planning” on page 25. It is important that your Sysplex Timer configuration provides redundant paths.

If you do run into a problem during the installation, you may need to revert back to using prior SYS1.PARMLIB(CLOCKxx) parameters until you can determine what went wrong. If you intend to suspend the use of the Sysplex Timer, you need to be prepared for that contingency.

Recovery situations are examined in Chapter 8, “Recovery” on page 97, in the event of a problem or a Sysplex Timer failure. Familiarize yourself with both chapters before you begin your installation.

Is there cause for concern?

People are edgy when attaching a new Sysplex Timer to a processor. This is probably a good instinct; not because the Sysplex Timer is a difficult resource to use, but because it is so critical where Sysplex configurations are concerned.

When a 9037 is attached to a processor and a port is enabled, the 9037 begins transmitting data to the processor immediately and continuously.

If the operating system is not set-up to use the 9037, then there is no cause for concern. It is the System Control Program (SCP) that must read the time value from the 9037 and set the CPU TOD. This is done automatically only if MVS/ESA has its CLOCKxx member of SYS1.PARMLIB, coded with ETRMODE YES.

Lets look at some different scenarios for attaching the Sysplex Timer. Here are the attachment possibilities that exist followed by a discussion of each:

- Basic Mode Processor
  1. With Sysplex Timer capable Operating System
  2. Without Sysplex Timer capable Operating System
- LPAR Mode Processor
  1. With Sysplex Timer capable Operating System
  2. Without Sysplex Timer capable Operating System

Basic Mode Processor

1. With Sysplex Timer capable Operating System

If you're planning an IPL: The most successful way to begin using the Sysplex Timer is to begin using it as part of a new initial program load (IPL). Here is a sample of how to do this. Let's assume that the 9037 is not attached to the processor yet.

1. Set the time on the Sysplex Timer. You may set the time manually or obtain the time from an external time source.

2. Prepare SYS1.PARMLIB(CLOCKxx) to accept the Sysplex Timer
3. Shutdown MVS/ESA
4. Attach the Sysplex Timer to the processor.
5. IPL MVS/ESA.

If you′re already IPL′ed: It is also possible to attach the Sysplex Timer without shutting down MVS/ESA. In this case, MVS/ESA would have already been IPL′ed with the SYS1.PARMLIB(CLOCKxx) member set up to use the Sysplex Timer. Therefore, when MVS/ESA was IPL′ed, it would have received message IEA261I (No ETR ports are usable. CPC continues to run in local mode). Follow these steps.

1. Set the time on the Sysplex Timer. In this example, the time set on the Sysplex Timer must be within ETRDELTA of the value that is currently in the TOD clock.
2. Attach the Sysplex Timer to the processor.

If the Sysplex Timer is not within ETRDELTA (default is 10 seconds), then TOD clock synchronization to the Timer will fail. MVS/ESA will continue to run in Local Synchronization mode.

Attaching the Sysplex timer without an IPL may not be the preferred method because it means that you are setting the Sysplex Timer to the current TOD clock value which may not be exactly correct according to UTC time standards.

If your Sysplex Timer is not synchronized with the rest of the world, you can ″adjust″ the time value. If you use an external time source (ETS), the time value in the Sysplex Timer may be beyond the 4.999 threshold required for ETS synchronization. If this happens to you, see “Synchronizing the Sysplex Timer with an External Time Source” on page 88.

2. Without Sysplex Timer capable Operating System

If running with an operating system that does not recognize the existence of a 9037 or with ETRMODE NO specified in CLOCKxx, then attaching the Sysplex Timer to your system will not harm your currently running production system. All 9037 interrupts to the operating system are disabled.

LPAR Mode Processor

Generally, there is no difference between Basic Mode and LPAR Mode. It is still the ETRMODE specification that determines whether the 9037 signals are accepted by the operating system. However, LPAR microcode is aware of the 9037 and sets the physical TOD clock from the 9037.

1. With Sysplex Timer capable Operating System

This is no different than if in Basic Mode except that a partitions logical TOD clock will be synchronized to the Sysplex Timer following every activation of the logical partition.

2. Without Sysplex Timer capable Operating System

If running with an operating system that does not recognize the existence of a 9037, or with ETRMODE NO specified in the CLOCKxx member of SYS1.PARMLIB, then all 9037 interrupts to the operating system in the LPAR are disabled.

Even with an operating system not using the 9037, PR/SM LPAR microcode is fully aware of its presence. In LPAR Mode, a separate logical TOD clock is established for each partition. The operating system itself has no direct access to the physical TOD clock hardware.

When the 9037 is attached, LPAR will synchronize the physical TOD clock to the 9037. LPAR will then readjust the logical TOD image ′offset′ for each partition as if nothing had ever happened. ***The non-Sysplex Timer capable operating system in the partition sees no effect.***

Additional LPAR Mode overhead in some situations: APAR OW09850 warns of a condition where MVS/ESA partitions running with ETRMODE NO could experience additional LPAR management overhead. This condition is not present in MVS/ESA V5.2 or higher.

The additional overhead may be seen following an automatic switchover of a Sysplex Timer Attachment Facility. The Sysplex Timer Attachment Facility switchover applies only to the 9121 511-based multiprocessor or a 9021 711-based multiprocessor in single image mode. This would occur because the last path from the Sysplex Timer to the MP-side has failed.

Chapter 7. Setting the Time and Offsets

This chapter discusses how to set the various clocks and local time offsets in your system both with and without the Sysplex Timer.

You should already have an understanding of setting the clocks without a Sysplex Timer, but this area is often misunderstood so this chapter begins with a review of these procedures using an ES/9000 (9121 & 9021) and ES/3090.

Next, you'll see how easy it is to perform the same function when using a Sysplex Timer.

Lastly, there is a close examination of the 9672 Parallel Transaction Server and 9672 Parallel Enterprise Server and how their various clocks are set both with and without a Sysplex Timer.

Multiple Clocks and Their Uses

Why so many clocks? The simple answer is *because there are many processors in each system*. There are support processors devoted to different functions that don't necessarily execute the real workload that the computer was intended for. That's good, because you wouldn't want *your* processor/server running those programs which are designed to support the management and health of the system. In most cases, we set the date and time on only one computer, and it cascades the information to the others.

Two types of clocks are available on ES/9000 mainframes.

1. Processor Controller Element (PCE) Battery Operated Clock (BOC)
2. Time of Day Clock (TOD)

Three clocks are available on the 9672 Parallel Transaction Servers and the 9672 Parallel Enterprise Servers.

1. Hardware Management Console (HMC) Battery Operated Clock
2. Support Element (SE) Battery Operated Clock
3. Time of Day Clock (TOD)

In addition to the real hardware clocks, Processor Resource/System Manager (PR/SM) allows a machine to be logically divided into multiple logical partitions. Each logical partition (LPAR) has its own logical TOD clock.

ES/3090 and ES/9000 9021 & 9121 Battery Operated Clock (BOC)

The battery operated clock is used for timestamps on the Processor Controller Element (PCE) hardware console logs. It should be set to your local time as closely as possible. This must be done manually since the Sysplex Timer signals do not reach the PCE at any time.

An advantage of doing this is so software time-stamped events (EREP, RMF, SYSLOG, etc) will match hardware error events in the hardware logs. This is useful when performing problem determination.

The ES/3090, 9021 and 9121 BOCs are set from the B1 option on the SYSDEF frame. Setting the BOC is not disruptive but the PCE will perform a warmstart. While executing a warmstart, the PCE is temporarily unavailable for normal PCE functions (for example, the hardware system console may lock up for several minutes).

The BOC may be used to set the TOD clock. Option B2 of the SYSDEF frame, Figure 37 on page 85, instructs the PCE to load the TOD clock at power-on-reset time. For the correct setting of the B2 value in your geographic time zone, see Table 13 (USA only).

If the B2 option is not enabled, the PCE battery operated clock will not be used to load the TOD clock.

The Zone Offset value should equal the current offset from Greenwich Mean Time (GMT). Set the Zone Direction to the direction from Greenwich, England. The United States is West of Greenwich.

Table 13. USA Time Zone Offsets

Regional Zone	DST (Spring)	STD (Fall)
Eastern	4:00/West	5:00/West
Central	5:00/West	6:00/West
Mountain	6:00/West	7:00/West
Pacific	7:00/West	8:00/West

Note: Select the appropriate values to be entered in the SYSDEF frame B2 area.

If you change the B2 option in the spring or fall to adjust for daylight savings time, you must also change the offset value in your System Control Program (SCP).

Note: To power-on-reset a PR/SM capable machine in LPAR Mode, requires that the operator set the TOD clock from the BOC. This is true even if a 9037 Sysplex Timer is being used. However, during the POR the processor (and PR/SM) will notice that a Sysplex Timer is attached. As a result the physical TOD clock will be set by the Sysplex Timer. Each partitions′ logical TOD clock will be set from the physical TOD clock at LPAR activation and used by the operating system that supports the Sysplex Timer.

```
                          System Definition                    (SYSDEF)

MACHINE TYPE: xxxx     MODEL: yyy    D= ACTION FOLLOWING POWER ON RESET
SERIAL NUMBER: nnnnn                   1. New Frame Name(A/N) :________
SYSTEM EC LEVEL: nnnnnnnn              2. Load Information(Hex) :
VERSION ID: xnnn                             MODE      ESA/390


 A= CONFIGURATION (Forces POR Required)      Load Addr: ____
   1. Maximum Installed                      Parameter: ________
                                             Target CP: _

 B= CLOCKS (B1 forces PC Warm Start)      (Above not used with LPAR POR)
   1. Set Date : __ ___ ____    day            I/O Pwr Seq Delay: __:__
         Time : __ : __                      Automatic Load: Not Active

   2. Enable Automatic TOD Setting      E= PROBLEM REPORT METHOD
     Zone offset:    __ : __ (hh:mm)  -> 1. Initiate by PA Only
     Zone direction: ____ (East/West)    2. Initiate by PA or RSF

                                          F=RECOVERY ACTIONS

 C= SYSTEM NAME                             1. I/O Interface Reset
   1. Set Name : ________                   2. Set Recovery Time: ___

 COMMAND ==>
```

This is an example of the SYSDEF frame on the ES/9000 9121. B1 is used to set the BOC to local time. B2 is used to set the time-of-day clock to GMT/UTC at power-on-reset.

Figure 37. SYSDEF Frame on ES/9000 9121

Setting the TOD from the BOC when planning a power-on-reset

(Without a Sysplex Timer)

Table 14 on page 86, and Table 15 on page 86, depict different ways installations have for setting the TOD clock and the different ways offsets are (or are not) used. Basic Mode and LPAR Mode examples are shown.

The tables provide a quick review on how to change the offsets in the spring and fall when ***not*** using a 9037 Sysplex Timer. The comments column suggests that you POR and Re-IPL in most cases, but sometimes this isn't necessary (especially in the spring when clocks are set ahead). Instead, with MVS you may issue the SET CLOCK command which will dynamically change the local time offset. This will not change the actual TOD clock value. It is also possible to change the SYSDEF local time (B1) at any time. This will cause the processor controller element (PCE) to perform an immediate warmstart. Lastly, you must ensure that you update the CLOCKxx or PARMTZ member offset ***before*** the next

IPL (when the Sysplex Timer is used, there is no reason to update CLOCKxx twice a year).

These are the steps you take to set the TOD clock ***if*** planning on performing a power-on-reset on an ES/9000 or ES/3090.

1. Change MVS/ESA to the new offset in SYS1.PARMLIB(CLOCKxx)
   - If MVS/XA, use SYS1.PARMLIB(PARMTZ)
2. Shutdown the SCP
3. Prepare for power-on-reset (release config)
4. SYSDEF B1 - Set the new local time
5. SYSDEF B2 - Set the new offset
6. Power-on-reset (POR)
7. IPL the operating system.

Table 14. Changing offsets without a 9037 Sysplex Timer (BASIC MODE)

SYSDEF B2 Option				
Used	BOC	Offset	TOD	Comments
No	Local	-	Local	RE-IPL & set TOD during IPL
No	Local	-	GMT/UTC	RE-adjust CLOCKxx offset in Parmlib and Re-IPL
Yes	Local	Yes	GMT/UTC	RE-adjust BOC local time & offset, Re-adjust CLOCKxx or offset in Parmlib, POR, and Re-IPL
				This is the preferred method.
Yes	GMT/UTC	No	GMT/UTC	RE-adjust CLOCKxx or offset in Parmlib and Re-IPL
Yes	Local	No	Local	RE-adjust BOC local time & offset, POR, Re-IPL

Power-on-Reset (POR) in LPAR Mode, requires the use of the SYSDEF frame for setting the TOD clock.

Table 15. Changing offsets without a 9037 Sysplex Timer (LPAR MODE)

SYSDEF B2 Option				
Used	BOC	Offset	TOD	Comments
Yes (required)	Local	Yes	GMT/UTC	Re-adjust BOC local time & offset, Re-adjust CLOCKxx offset in Parmlib, POR, Re-Activate LPARs, Re-IPL LPARs
				This is the preferred method.
Yes (required)	GMT/UTC	No	GMT/UTC	Re-adjust CLOCKxx offset in Parmlib, Re-IPL LPARs
Yes (required)	Local	No	Local	Re-adjust BOC local time, POR, Re-Activate LPARs, Re-IPL LPARs

Setting the TOD Offset and BOC when NOT planning a power-on-reset

(Without a Sysplex Timer)

It is possible to change the TOD local offset and the BOC without the need of a power-on-reset, and thus delaying an IPL to a convenient time.

Proceed as follows:

1. Change MVS/ESA to the new offset in SYS1.PARMLIB(CLOCKxx)
   - If MVS/XA, use SYS1.PARMLIB(PARMTZ)
   - This step must be done ***before*** the next IPL
2. Shutdown subsystems software (IMS)
3. Issue the MVS - SET CLOCK command
   - Changes the local offset
4. Bring up subsystem software
5. SYSDEF B1 - Set the new local time
   - This step performs a warm start of the PCE and can be done at any time. Following the warmstart, the hardware console will begin logging timestamps at the new local time. This allows the CE hardware logs and the SCP syslogs to correspond.

CAUTION

Changing the local offset can affect applications and subsystems making it difficult to perform recovery procedures should they be needed. If the application uses a local timestamp mechanism, the application should be shut down even if the offset is moving forward in the spring. ***It is recommended that some subsystems such as IMS be shutdown during any offset change.*** In the fall when the local time offset is set backward, you are required to shutdown the application for one hour to avoid duplicate time stamps for that hour.

Hopefully in the future these applications subsystems will monitor UTC rather than local time and the requirement for shutting down the applications will be eradicated. See FLASH 4006 on HONE or IBMLINK regarding current IMS implications.

Setting the TOD With the Sysplex Timer

For the first time: See Chapter 6, "Attaching the Sysplex Timer to the Processor" on page 79.

After an IPL: Once the Sysplex Timer has been installed and connected to your processor, you have the capability of setting the 9037 time-value. However, doing so could have dire consequences depending on your circumstances. Therefore ***setting a new time value is best done when no operating systems are IPL'ed.*** Changing offsets for local time are not as dangerous, but some thought must go into that also.

In a non-Sysplex Environment

If you are already IPL'ed with ETRMODE=Y, then setting the 9037 to a new time-value will fail to set the TOD clock if the value is beyond ETRDELTA of the current TOD clock-value. MVS/ESA time synchronization will revert using "local mode" (stop using the Sysplex Timer).

In a Sysplex Environment

If a multi-system Sysplex configuration is already IPL'ed using a Sysplex timer;

never,
never,
NEVER

"Set the Time" on the Sysplex Timer. MVS/ESA V4 processors will enter a restartable wait state and only one processor can be restarted without an IPL. MVS/ESA V5 systems will enter a non-restartable wait state and an IPL will be required on all MVS/ESA V5 systems.

Synchronizing the Sysplex Timer with an External Time Source

It is possible for the Sysplex Timer to be out of tracking range of the external time source when you access it for the first time. When this happens, the MVS/ESA console will receive message IEA272I with RC=44 and the 9037 log will include a line showing reason code RC044.

To correct the problem without doing a "SET THE TIME" action, you must manually "ADJUST THE TIME" until the 9037 time is synchronized with the External Time Source (within 4.999 seconds). Applying the adjustment could take a day or more depending on how badly the 9037 is out of synchronization with the external time source. Make the adjustment in the following manner:

1. Select ***Time*** on the Sysplex Timer console main menu;
2. Select ***Adjust the Time*** from the pull-down menu;
3. Specify an increase (+) or decrease (-) of up to 4.999 seconds of Sysplex Timer manual time "Adjustment Amount";
4. Wait for the time adjustment to occur. This will take approximately twelve hours for each one second of time being adjusted. You can view the adjustment slowing taking place by pressing F4 (Refresh).
5. Repeat step 4 until the Sysplex Timer and the External Time Source are within 4.999 seconds of each other.

6. ACTS: From the ***Profile*** pull-down menu on the 9037 console, select ***Change External Timer Source Options.*** Then specify yes (option 1) to ***Enable Automatic Adjustment***, and key in your desired interval to complete the re-synchronization and continue synchronization in the future.

   Note: If you are not using ACTS as your External Time Source, the automatic adjustment begins approximately every 10 minutes.

For more information see “Adjust the Time” on page 57 and “Calculate Adjustment” on page 58.

Changing the Offset when using a 9037 Sysplex Timer

First, the SYS1.PARMLIB(CLOCKxx) member must have ETRMODE=Y and ETRZONE=Y (see “ETRZONE YES|NO” on page 12) before the current IPL.

Next, use the Sysplex Timer Console *Change Offsets* panel to enter the new offset (see “Change Offsets” on page 56). Or if you prefer, you can schedule the 9037 to change the offset while you are home sleeping.

Now you′re done!

On the ES/9000 or ES/3090: The local time in the ES/9000 and ES/3090 Processor Controller Element BOC is not in contact with the Sysplex Timer. Therefore the PCE battery operated clock must be set to the new local time manually. This can be done non-disruptively from the SYSDEF frame (B1 option) at any time.

On the 9672 S/390 Servers: The Sysplex Timer offset-value will cascade to the 9672 Service Element′s (SE) every evening at 23:00 hours and then cascade to the Hardware Management Consoles (HMC) at 23:15 hours.

If you′d like the new offset information to flow to the Service Element and the HMC sooner, you may force the 9672 to do so. First logon to the Service Element and from the Customize pull-down menu, indicate that you want to perform the Customize Date and Time function. You will receive a message indicating that you cannot perform that function since the CPC is connected to a Sysplex Timer. While you′re being notified of this, the SE is being updated with the new offset information from the CPC anyway. Following that procedure, logoff of the SE and use the HMC Customize Date and Time icon and do the same thing. Now both the SE and the HMC will contain the correct local time offset without the need to wait until 23:00 and 23:15 hours.

Programs and application subsystems: Changing the offset may be done while the operating system is running, but some application programs may need to be shutdown first. For example, the current release of IMS should be shutdown both in the spring and the fall.

Changing Offset on 3090′s, 9121 320-based, 9021 340-based Processors

If the CLOCKxx member is specified correctly and an offset is executed from the Sysplex Timer (either manually or scheduled), the offset change takes effect immediately on all processors except the ES/3090 J/T, 9121 320-based, and 9021 340-based processors.

On the ES/3090, 9021 340-based, and 9121 320-based systems, the offset may not be recognized immediately. These processors check for offset changes every 30 minutes. You may force an immediate recognition of the event by issuing the MVS/ESA ***SETETR PORT=n*** command after the scheduled event occurs. See “SETETR” on page 15.

9672 Parallel Transaction Server and 9672 Parallel Enterprise Server

The 9672 Server has three types of clocks and several ways to set them. They are the Hardware Management Console (HMC) battery operated clock, the Support Element (SE) battery operated clock, and the Central Processing Complex (CPC) time-of-day (TOD) clock.

The methods for using the 9672 console and its user interface will undoubtedly change over time due to Engineering Changes and added functions. If the following procedures and functions do not operate exactly the same in your environment, refer to the Hardware Management Console Guide for your system.

9672 Environment

Without a Sysplex Timer

During a 9672 power-on-reset, the Service Element′s (SE) date, time, and offset are used to set the CPC TOD clock. This is analogous to the ES/9000 Processor Controller Element setting the TOD clock at power-on-reset using the SYSDEF B1 and B2 options.

To adjust for drift between the CPC TOD clock and the Service Element′s battery-operated clock, the Service Elements clock will automatically be set by the CPC every night at 23:00 hours. The offset change is also reflected in the 9672 Hardware Management Console (HMC). This automatic cascading of the clock values occurs on the HMC at 23:15 hours every night.

Note: If a CPC is operating and a user manually changes the SE battery-operated clock, then the 23:00 synchronization will not occur. The SE and the CPC will be out of synchronization until the next power-on-reset, or until the next time the CPC TOD is changed by the Set Clock (SCK) instruction (x′B204′) during an IPL.

With a Sysplex Timer

In this environment, the Sysplex Timer is the master clock and all other clocks (CPC, SE, and HMC) will be synchronized to it. Changes to the Sysplex Timer offset are reflected immediately in the CPC and MVS/ESA. The SE and the HMC will reflect offset changes at 23:00 and 23:15 respectively. This means that an offset change for daylight savings time might appear as though it was unsuccessful when viewing the HMC time, however the CPC and MVS/ESA will have the new offset values as reflected in SYSLOG.

When a Sysplex Timer is attached, users are not permitted to set the time values on the SE manually. If the user attempts to do this, a message box will appear stating that the system is connected to a Sysplex Timer. When the user presses the OK button on this message panel, the SE will resynchronize to the Sysplex Timer immediately.

9672 Hardware Management Console

The Hardware Management Console (HMC) provides a means of operating multiple CPC′s, or servers, from the same console. It does this by communicating with each CPC through their Support Elements (SE). When tasks are performed at the Hardware Management Console, the commands are sent to one or more Support Elements which issue commands to their CPC′s.

The HMC is a Personal System/2 (PS/2) attached to the Support Elements by a local area network. It runs Operating System/2 (OS/2) and a program called the Hardware Management Console Application (HWMCA). Like any PC, it contains a clock mechanism to set the date and time.

The HMC is set to local time. Time may be set from an OS/2 command prompt using the ″time″ command or ideally from the HWMCA.

The HWMCA screen is divided into three interrelated areas. They are:

1. Views
2. Groups Work Area
3. Tasks Area.

To set the date and time from the HMC, go to the **Views** area, double click the mouse pointer on the **Console Actions** icon. The **Groups Work Area** will then change to the **Console Actions Work Area.** The Console Actions Work Area includes an icon called **Customize Console Date/Time.** Double click the icon.

A window will be opened that is used to change the date and time of the Hardware Management Console battery operated clock and to change the time zone offset from the Universal Time Coordinate (UTC).

Within the window is a ″Customize″ push button which is selected when you want to save any new settings you have entered.

Note: The ″Customize″ push button will not save the new settings if your system is attached to a Sysplex Timer.

Customize Date/Time

Customize Date/Time allows you to:

- Change the time and date of the battery operated Hardware Management Console clock, and
- Change the time zone offset from the Universal Time Coordinate (UTC).

The battery operated clock keeps the time and date for the Hardware Management Console. If the operator does nothing and if the system is operating, an attempt will be made every night to synchronize the HMC clock with a CPC that has been enabled for time synchronization. A CPC is enabled for time synchronization by using the **Change Object Definition** or the **Add Object Definition** tasks. The Add Object Definition icon is only available to users logged onto the HMC as the Access Administrator. The Change Object Definition icon is available to the Access Administrator or the Service Representative userid′s.

The HMC will synchronize to the first CPC that is recognized as enabled for time synchronization. If all CPC′s are attached to a Sysplex Timer, it is recommended that they all be enabled for time synchronization. If only some CPCs are Sysplex Timer attached, those that are should be enabled for time synchronization. If no CPCs are Sysplex Timer attached, then select one CPC for time synchronization.

Setting the clocks can be performed in a different ways as shown below.

Support Element (SE)

Use one of these procedures to update the date and time of individual Support Elements or Groups of Support Elements. In these procedures the Support Element(s) may be set from the Hardware Management Console (USE CONSOLE TIME) or to a discrete date and time that you determine (USE NEW TIME).

Using Customize Date/Time

To use **Customize Date/Time** for individual CPC's:

1. Open the **Task List** from the **Views** area.
2. Open **CPC Operational Customization Tasks** from the **Task List Work Area.**
3. Open **Groups** from the **Views** area.
4. Open the group that contains the CPC or CPCs whose date and time you want to customize.
5. Select the CPC whose date and time you want to customize.
6. Drag and drop the selected object on **Customize Date/Time** in the **CPC Operational Customization Tasks** area.

The **Support Element Date and Time** panel will display the current Hardware Management Console date and time. Select the **Use console time** pushbutton to update the support element with the Hardware Management Console date and time, or enter a new date and time and select the **Use new time** pushbutton. Online help is available to guide you through completion of the task.

To use **Customize Date/Time** for a group of CPC's:

1. Open the **Task List** from the **Views** area.
2. Open **CPC Operational Customization Tasks** from the **Task List Work Area.**
3. Open **Groups** from the **Views** area.
4. Open the group that contains the CPC or CPCs whose date and time you want to customize.
5. Select multiple CPC's within the group whose date and time you want to customize.
6. Drag and drop the selected objects on **Customize Date/Time** in the **CPC Operational Customization Tasks** area.

Again, the **Support Element Date and Time** panel will display the current Hardware Management Console date and time. Select the **Use console time** pushbutton to update the support element with the Hardware Management Console date and time, or enter a new date and time and select the **Use new time** pushbutton.

Now the Hardware Management Console, the Support Element(s), and the CPC time-of-day clock all have the same date and time.

Note: The Date and Time for the Support Elements with a Sysplex Timer operational will not be changed.

Starting a CPC Console Session

There are other ways to set or check the status of the date and time of the CPC TOD clock. From the Hardware Management Console it is possible to ***logon*** to the Support Element. This is sometimes called ***Starting a CPC Console Session***.

To start a CPC Console session, perform the following at the Hardware Management Console:

1. Open the **Task List** from the **Views** area.

2. Open **Daily Tasks** from the **Task List Work Area**
3. Open **Groups** from the **Views** area.
4. Open the group that contains the CPC with the support element that you want to connect to.
5. Select one CPC.
6. Drag and drop the selected object on **Single Object Operations** in the **Daily Tasks** area.

Once the link to the selected Support Element has completed, the CPC Console ***window*** is displayed on the Hardware Management Console Workplace. This window has five pull-down menu options. They are **O**perate, **A**nalyze, **C**ustomize, **S**ervice, and **H**elp.

Each pull-down menu provides a selection of several options and functions to perform.

TOD Switch

This function is used less frequently than on previous System/370 products, because the processor unit TOD clock is normally set automatically by the Hardware Management Console and the Support Element.

The **O**perate pull-down provides the *Enable setting the Time of Day Clock* option. This option is similar in function to the TOD SWITCH on previous IBM processors. The switch is used when the TOD has not been set at all. For example, when the messages below appear on the MVS operator console, the switch would be set while replying ″U″ and pressing enter on the MVS console. The clock remains enabled for 10 seconds then returns to its normal, protected state.

> IEA903A {REPLY U THEN DEPRESS TOD CLOCK SECURITY SWITCH WHEN ENTERED TIME OCCURS|REPLY U WHEN THE ENTERED TIME OCCURS}
>
> IEA889A REPLY U THEN DEPRESS TOD CLOCK SECURITY SWITCH

Sysplex Timer Status on a 9672

The **A**nalyze pull-down provides the *Sysplex Timer* option. This option provides a panel which shows the current status of the Sysplex Timer. It′s appearance is similar to the output of MVS message IEA282I (see “IEA282I” on page 128).

9672 Support Element Date and Time

The **C**ustomize pull-down provides the *Support Element Time and Date* option. This option allows you to verify or change the date, local time, and zone offset, from Universal Time Coordinate on the Support Element. The Support Element′s battery operated clock keeps the time and date of the Support Element. The processor unit TOD clock will be set to this value when the system is activated through the next power-on-reset function.

Sysplex Timer Note

If the Sysplex Timer feature is installed, the time and date used by the Support Element will be updated by the Sysplex Timer. If the Sysplex Timer is not installed, you should verify or set the date, local time, and zone offset in the Support Element by one of the methods already described.

More about Offsets

Setting the TOD Clock to Local Time

Some installations set their TOD clock to local time rather than GMT/UTC and thus have a zero value for the local time offset. This allows you to ignore changes to the CLOCKxx or PARMTZ member of Parmlib (with no Sysplex Timer) when changing the offsets in the spring and fall but typically requires a shutdown and power-on reset. ***Setting the TOD clock to local time without an offset is not a recommended practice.***

Setting the TOD Clock in a Sysplex

If you choose to set the TOD clock to local time, local time changes can be accomplished only by resetting the TOD clock in the processor. Remember that the TOD clock is assumed to be GMT/UTC. Daylight savings time changes should be done through the use of offsets when running in a Sysplex. You should be aware of the following consequences to Cross-System Coupling Facility (XCF) and multisystem applications using XCF services when you set the clock backward or forward.

Setting the TOD clock Backward (Sysplex)

When doing its periodic status monitoring, XCF records the time stamps obtained from the TOD clock in the COUPLE data set. If you set the TOD clock back a period of time, then time stamps obtained from the TOD clock may duplicate time stamps already recorded in the COUPLE data set. When a system attempts to IPL into the sysplex, XCF compares time stamps obtained from the TOD clock value with the time stamps previously recorded in the COUPLE data set. If the time stamp in the COUPLE data set is later than the time stamp specified by the incoming system, XCF assumes this is an error and does not allow the system to join the sysplex. The system would not be allowed to IPL into the sysplex until the time stamps obtained from the TOD clock became greater than the time stamps previously recorded in the COUPLE data set.

Similar problems may exist on MVS applications which record time stamps on external media such as database logs. These logs could be used by several processes, such as database recovery, which depend on progressively increasing time stamps to preserve the ordering of events. Setting the TOD clock backward could make the log useless for database recovery, creating the potential for serious problems in specific environments.

Setting the TOD clock Forward (Sysplex)

As part of its status monitoring, XCF periodically checks the status of each system in the sysplex. XCF uses the value specified by the failure detection interval for its determination of system failure. If you set the TOD clock ahead a period of time, then the difference between a time stamp previously recorded in the COUPLE data set and a time stamp obtained from the reset TOD clock may exceed the specified failure detection interval. If so, XCF initiates a ″status update missing″ condition, which in turn could cause the system to be removed from the sysplex (that is, the system is put into a wait state).

Chapter 8. Recovery

This chapter describes the following recovery situations:

- Sysplex

  What happens in a Sysplex if there is a Sysplex Timer problem? What about if the Sysplex is only a 1-System sysplex? How does recovery differ between MVS/ESA V4 and V5? What is Wait State X′0A2′? What XCF messages will I see when there is a Sysplex Timer problem?

- Spin Loops

  When an adjustment to time is being made, it is possible that MVS/ESA will temporarily ″spin″ to avoid duplicate timestamps. This is not an error necessarily. This chapter discusses the handling of spin loops.

- Sysplex Timer Failure

  If the Sysplex Timer is going to be down indefinitely (for whatever reason), how should you prepare to re-IPL without it?

- Single_Image Multiprocessor Recovery

  If you use a multiprocessor in single image mode, you should read this recovery information. Different MP′s behave in different ways during 9037 recovery situations.

- Year-End Problem

  This problem went away with the V2.1 release of the 9037 console diskette software.

Sysplex Recovery Considerations

The follow section describes the Sysplex messages that you will encounter if the Sysplex Timer suddenly becomes disabled. If the Sysplex Timer is configured incorrectly between Sysplex Members, IXC messages are also generated.

Differences between MVS/ESA V4 and MVS/ESA V5

If you are running a Sysplex with a Sysplex Timer and the Sysplex Timer fails, each sysplex member will enter a X′0A2′ Wait State.

MVS/ESA V4 and MVS/ESA V5 behave differently under this condition. Both operating systems will put the processors into a 0A2 Wait State, but recovery from the condition has changed significantly in version 5.

In MVS/ESA V4, a 0A2 Wait State with Reason Code 0C may be restartable by one of the sysplex participants. Others will have to re-IPL.

In MVS/ESA V5, a 0A2 Wait State with Reason Code 114 is non-restartable.

Both environments are discussed below. For an exact description of the IXC messages, see *MVS/ESA V5 System Messages, Volume 5 (IGD - IZP), GC28-1484*.

Sysplex Timer Problems (in a Sysplex)

If the Sysplex Timer facility is lost after the IPL, the result depends on whether the sysplex contains one system or two or more systems.

Sysplex Timer Problem in a 1-System Sysplex (MVS/ESA V4 & V5)

When XCF determines that the only system in a sysplex has lost access to the Sysplex Timer, XCF continues processing by using the TOD clock on this system. In this case, no other systems can join the sysplex until the Sysplex Timer is available to all systems in the sysplex.

When the Sysplex Timer becomes available and usable, the system returns to using the Sysplex Timer and other systems can IPL and join the sysplex.

Sysplex Timer Problem in Sysplex of Two or More Systems (MVS/ESA V4)

One System Loses the Sysplex Timer:

When XCF determines that a system in a sysplex of two or more systems has lost access to the Sysplex Timer, XCF issues message IXC407W and puts the system in restartable wait state X'0A2':

```
IXC407W  XCF IS UNABLE TO CONTINUE: WAIT STATE CODE: 0A2 REASON
              CODE: 00C
              XCF HAS LOST ACCESS TO THE EXTERNAL CLOCK.
              IF YOU RESTART THIS SYSTEM, ALL OTHER SYSTEMS IN THE
              SYSPLEX WILL BE PLACED IN A WAIT STATE.
              RESTART THIS SYSTEM TO CONTINUE.
```

Message IXC407W requests the operator to restart the system.

If the Sysplex Timer becomes available before the operator restart, the system stays in the sysplex.

If the operator does not restart the system and the Sysplex Timer is still lost, then another system in the sysplex recognizes that the system has become inoperative, based on the failure detection interval for the wait-stated system. The other system issues message IXC402D:

```
IXC402D  sysname LAST OPERATIVE AT hh mm ss: REPLY DOWN IF MVS
              IS DOWN OR INTERVAL=sssss TO SET A REPROMPT TIME.
```

All Systems Lose the Sysplex Timer:

If the Sysplex Timer facility fails and all systems lose access to the Sysplex Timer, XCF on all systems issues message IXC407W and puts all systems in restartable wait state X'0A2':

```
IXC407W  XCF IS UNABLE TO CONTINUE: WAIT STATE CODE: 0A2 REASON
              CODE: 00C
              XCF HAS LOST ACCESS TO THE EXTERNAL CLOCK.
              IF YOU RESTART THIS SYSTEM, ALL OTHER SYSTEMS IN THE
              SYSPLEX WILL BE PLACED IN A WAIT STATE.
              RESTART THIS SYSTEM TO CONTINUE.
```

Message IXC407W requests the operator to restart the system.

If the Sysplex Timer is made available and usable, the systems can be restarted by the operator.

If the Sysplex Timer cannot be made available and usable, then the operator can restart **one** system. XCF on the restarted system issues message IXC402D for other systems in the sysplex:

```
IXC402D  sysname LAST OPERATIVE AT hh mm ss: REPLY DOWN IF MVS
               IS DOWN OR INTERVAL=sssss TO SET A REPROMPT TIME.
```

Message IXC402D requests the operator to respond DOWN or to set a reprompt time. The operator should respond DOWN if only the restarted system should remain in the sysplex.

When the Sysplex Timer is available and usable, the restarted system returns to using the Sysplex Timer and XCF issues message IXC411I to indicate that the Sysplex Timer is available and usable.

```
IXC411I  SYSTEMS CAN NOW ENTER THE SYSPLEX USING SYNCHRONOUS
               CLOCK ID=xx
```

Other systems can be IPLed and rejoin the sysplex.

Recovery Actions

- The operator should contact the hardware support.
- The system programmer should do the following:
  - If this message appears on every system in the sysplex, there is a problem with the 9037 itself. Decide which system in the sysplex you want to keep up and respond to message IXC407W on that system by restarting it. The restarted system removes all other systems from the sysplex. All the other systems enter a non-restartable wait state.
  - If this message is not issued on every system in the sysplex, the problem probably involves this system's connection to the ETR clock. You can keep either this system running or all the other systems running. If you want to keep just this system going, ask the operator to restart it.

    In either case, ask the operator to do one of the following:
  - Restart this system.

    If the 9037 is not available when this system is restarted, this system will remove all the other systems from the sysplex. All the other systems will enter a non-restartable wait state.

    If the 9037 is available, this system will rejoin the other systems in the sysplex.
  - Do not restart this system.

    If this system is not restarted, another system in the sysplex issues message IXC402D. Reset this system, and reply DOWN to message IXC402D on the other system.

    After the ETR clock is fixed, re-IPL this system into the sysplex.

Sysplex Timer Problem in Sysplex of Two or More Systems (MVS/ESA V5)

One System Loses the Sysplex Timer:

When XCF determines that a system in a Sysplex defined as a multiplex has lost access to the Sysplex Timer, XCF issues message IXC462W and puts the system in a non-restartable wait state X'0A2', with reason code X'114'.

If there are one or more other active systems in the sysplex that did not lose Sysplex Timer connectivity, then one of the systems will recognize that the system has become inoperative, based on the failure detection interval for the system. The other system will remove the system from the sysplex.

All Systems Lose the Sysplex Timer:

If the Sysplex Timer fails (and there is no connected backup Sysplex Timer) so that all systems lose access to the Sysplex Timer, XCF on all systems issues message IXC462W and puts all systems in a non-restartable wait state X'0A2', reason code X'114'

If the Sysplex Timer cannot be made available and usable, then the operator can re-IPL **one** system. XCF on the re-IPLed system removes the other systems from the sysplex.

When the Sysplex Timer is available and usable, the re-IPLed system returns to using the Sysplex Timer and XCF issues message IXC411I to indicate that the Sysplex Timer is available and usable. Other systems can now rejoin the sysplex via a re-IPL.

Also, if the Sysplex is on the same physical machine (LPAR images or VM Guests), then the Sysplex will remain operational if the processor loses access to the 9037.

Wait State X'0A2'

For certain problems, XCF issues abend X'00C' or wait state X'0A2'. The wait state can be restartable or non-restartable, as indicated by the reason code.

Note: Wait State X'0A2' with Reason Code 114 is Sysplex Timer related.

XES issues abend X'026' or wait state X'0A2' in certain error conditions.

X'0A2'

Explanation: Cross-system coupling facility (XCF) or cross-system extended services encountered a non-recoverable error and stopped the system. The system also issues this wait state in response to an operator request to stop the system.

The reason codes in register 15 which relate to the Sysplex Timer are:

	Reason Code (hex)	Explanation
MVS V4 ==> only	0C	A system lost access to the ETR. Preceding message IXC407W explains the problem. This is a restartable wait state.
MVS V5 ==> only	114	This is a non-restartable wait state due to the loss of the ETR link or the ETR itself.

Note: Other Reason codes also exist, but are not related to the Sysplex Timer so they are not included here.

Incorrect External Time Reference (MVS/ESA V4 or V5)

When the operator IPLs a system in multisystem mode, XCF requires the same External Time Reference (ETR) facility for all MVS systems in the sysplex. If the 9037 network is not the same as the one used by the current system or systems in the sysplex, XCF issues message IXC406I stating that the system joining the sysplex is using a different 9037 than the other systems in the sysplex:

```
IXC406I  THE SYSTEM IS CONNECTED TO ETR NET ID = xx. THE OTHER
             ACTIVE SYSTEMS IN THE SYSPLEX ARE USING ETR NET ID = yy.
```

The system restarts XCF and issues message IXC207A to request a new COUPLExx parmlib member:

```
IXC207A  XCF INITIALIZATION IS RESTARTED. RESPECIFY COUPLE SYSTEM
             PARAMETER, REPLY COUPLE=xx
```

Recovery Actions: The operator should check the status of the ETR and notify the system programmer.

The system programmer should instruct the operator to do one of the following:

- Specify the COUPLE00 parmlib member on this system to IPL it in XCF-local mode. None of the multisystem XCF services will be available.
- Request a different COUPLExx parmlib member to specify a different sysplex.
- Correct any 9037 configuration and cabling problem and retry with the same COUPLExx parmlib member.
- Enter a VARY XCF command to remove any systems in the sysplex that are not connected to the correct ETR clock.

If the problem persists, search problem reporting data bases for a fix for the problem. If no fix exists, contact the IBM Support Center.

If the same simulated ETR is specified but the central processor identifiers are not alike, XCF issues message IXC416I stating that simulated ETR is supported only in a sysplex running on the same CEC:

```
IXC416I  SIMETRID IS ONLY SUPPORTED IN A SYSPLEX RUNNING ON THE
             SAME CPC.
```

IXC416I could mean one of the following:

- Systems running as a guest on a VM system do not all have CPUIDs that represent the same system.
- Systems running in a PR/SM environment are not all on the same side of a physically partitioned processor complex.

The system restarts initialization of XCF, which issues message IXC207A prompting the operator for a COUPLExx parmlib member:

```
IXC207A  XCF INITIALIZATION IS RESTARTED. RESPECIFY COUPLE SYSTEM
             PARAMETER, REPLY COUPLE=xx
```

Recovery Actions: To use SIMETRID in a sysplex, the system programmer should do one of the following:

- Make sure that this system should be part of this sysplex. If not, specify the COUPLExx parmlib member for the correct sysplex.
- If the systems are running on VM, make sure that the processor identifiers (CPUIDs) of all the systems in the sysplex represent the same machine. The VM systems must be on the same side of a physically partitioned machine.
- If the systems are running in a LPAR environment, make sure all the systems in the sysplex are on the same side of a physically partitioned processor complex.

For any system to use SIMETRID, all the systems in the sysplex must use SIMETRID. If this system should not be using SIMETRID, change the SIMETRID parmlib specification in the CLOCKxx parmlib member.

Spin Loops

A spin loop occurs when one processor in a multiprocessor environment is unable to communicate with another processor or requires a resource currently held by another processor. The processor that has attempted communication is the ***detecting*** processor. The processor that has failed to respond is the ***failing*** processor.

The detecting processor continuously attempts its communication with the failing processor until either:

- It is successful.
- A specified time interval has passed.

When the communication is not successful within this interval, an ***excessive spin loop time out*** exists. The detecting processor then initiates recovery processing for the condition.

MVS processing for excessive spin-loop conditions can provide recovery without any actions or decisions from the operator.

There are four recovery actions to choose from to resolve an excessive spin loop condition. These actions are defaults or they are specified in the EXSPATxx member of SYS1.PARMLIB.

They are:

- SPIN
- ABEND
- TERM
- ACR

For a detailed explanation of these recovery actions, refer to your operating systems ***Recovery and Configuration Guide*** or the ***Initialization and Tuning Reference***.

Spin Loops During IPL

If you experience a spin loop during IPL with a Sysplex Timer connected, it is possible that wrap plugs were left in unused ports following installation of the 9037. Remove the wrap plugs and retry the IPL.

Spin Loop During Nucleus Initialization

During nucleus initialization, the system may issue a WTOR message and wait in a spin loop for the operator to respond. In this case, XCF can encounter a status update missing condition and cause global resource serialization (GRS) to disrupt ring processing.

The operator should respond to the WTOR in a timely manner and ensure that global resource serialization has restarted ring processing.

Spin Loops (during hardware patch apply)

This information is intended for the IBM Service Representative, and is placed here for your information only. So do not use the command discussed in this section.

There is an excessive spin loop exposure on some systems when using the Sysplex Timer.

SYMPTOM: SPINLOOP DETECTED ABEND071 RC10 DURING PCE WARMSTART
MVS message IEE178I, †Automatic recovery is in progress. No operator action is required† may also be seen.

On the ES/3090-T/J, 9021 340-based, and 9121 320-based systems using the Sysplex Timer, an ETR Timer pops every 30 minutes and issues a diagnose instruction to check 9037 status. The diagnose will not complete while the processor controller element (PCE) is being warmstarted.

There is a window in which the 30 minute timer could pop during a PCE warmstart initiated by a IBM Service Representative activity (restart, vary off for EC/PATCH, or exit EC/PATCH after concurrent patch apply).

This will cause an excessive spinloop detected (ABEND071 RC10) and IEE178I message.

As a temporary work around you may increase the spintime in the **EXSPATXX** module to 15 minutes (SPINTIME=900). This will prevent spinloop recovery from detecting the loop. This can be set and reset dynamically by issuing the **SET EXS=xx** command to point to an alternate parmlib member. The alternate member could contain a different value for spintime. The SPINTIME parameter allows you to specify the excessive spin loop timeout interval where SPINTIME=sss equals the number of seconds to spin. In basic mode, the default spintime is 10 seconds. In LPAR mode or as a VM guest, the spintime default is 40 seconds.

A more permanent solution is provided by the use of the ***SETETR SUSPEND*** command. **The SUSPEND parameter is not documented in the MVS manuals since it is intended for IBM Service Representatives during processor hardware PATCH application.** The command will reset the 30 minute timer used by MVS to check on the 9037 status. After the command is issued, there are 30 minutes in which a PCE warmstart can be safely performed without the worry of a spinloop.

The command is provided by APARs OY55659 & OY58466. Ensure that all applicable patches are installed prior to applying this PTF.

Note: On the 9221, 9121 511-Based, 9021 520-Based, 711-Based, and 9672 processors, the Sysplex Timer diagnose instruction is not used, so the warmstart is not a problem. On these machines the SETETR SUSPEND command will be rejected.

Sysplex Timer Failure

The 9037 has failed! What now?

Perhaps someone accidentally turned off the 9037, or kicked out the fiber cables that go to the processor. Maybe the 9037 has really had a component failure and will be unavailable for an extended period of time.

How should you plan for such a dilemma?

Be prepared and understand your options.

If you cannot immediately reestablish communication with the 9037, your MVS/ESA images will revert to using the processor oscillator. This might be acceptable if you are not running a Sysplex. If you are running a Sysplex, a re-IPL may be in your future. See “Sysplex Recovery Considerations” on page 97 for more information regarding Sysplex Timer problems while running in a Sysplex. If all of the Sysplex members are on the same CEC (LPAR Mode), then you′ll want to consider using SIMETRID in SYS1.PARMLIB(CLOCKxx) until the 9037 is operational again.

If you intend to re-IPL or power-on-reset, you need to know in advance what value the TOD clock and local offset will become once you′ve come back up. To avoid surprises, refer to Table 14 on page 86 (Basic Mode) and Table 15 on page 86 (LPAR Mode). These tables help determine the TOD clock and local offset values based on:

1. the SYS1.PARMLIB(CLOCKxx) TIMEZONE parameter
2. the SYSDEF B1 setting during the power-on-reset
3. the SYSDEF B2 setting during the power-on-reset.

These settings should not be ignored just because a Sysplex Timer has been installed.

What are results if I IPL after the 9037 has become unavailable?

You should know in advance what the TOD clock and local offset will become if you need to IPL in an emergency without the Sysplex Timer.

The 9037 won′t be used if

1. the operating system doesn′t specify its use
2. the operating system isn′t capable of using it
3. the 9037 is disabled either intentionally or due to failure.

Table 16 on page 105 summarizes the results of the various SYS1.PARMLIB settings when the 9037 is either available or unavailable. Use this table as a reference for your planning.

Table 16 (Page 1 of 2). What to expect following an IPL

Configuration		Clock usage		
CLOCKxx	9037 avail ?	Basic Mode	LPAR Mode	Comments
ETRMODE Y	Yes	MVS will use the Sysplex Timer time value.	MVS will use the Sysplex Timer time value in this logical TOD.	LPAR - Operating systems in other partitions are not required to use the 9037.
		SYSDEF B2 optional.	SYSDEF B2 required.	MVS ″set clock″ command is disabled.
ETRMODE Y	No	The operator will be prompted to set the TOD during IPL.	The partitions ″logical TOD clock″ based on SYSDEF B2.	MVS will receive message during IPL. See “IEA265I” on page 123.
			The operator will be prompted to set the TOD during IPL.	
		SYSDEF B2 optional.	SYSDEF B2 required.	
ETRMODE N	Yes	MVS will use the processor TOD value or PROMPT will be used if specified.	All partitions logical TOD set by 9037 at activation. All subsequent 9037 interrupts to this LPAR are disabled.	Operating systems in other partitions may use the 9037 if desired.
		All 9037 interrupts are disabled.		
		SYSDEF B2 optional.		
ETRMODE N	No	MVS will use the processor TOD value or PROMPT will be used if specified.	MVS will use the partitions ″logical TOD clock″, set from SYSDEF B2.	Every partition will be set from the physical processor TOD clock at activation.
		SYSDEF B2 optional.		
ETRZONE Y	Yes	MVS will use the offset specified in the 9037.	MVS will use the offset specified in the 9037.	ETRZONE default is Y when ETRMODE is Y.
				MVS ″set clock″ command is disabled.
ETRZONE Y	No	MVS will use TIMEZONE, specified in PARMLIB.	MVS will use TIMEZONE, specified in PARMLIB.	ETRZONE default is Y when ETRMODE is Y.
ETRZONE N	Yes	MVS will use TIMEZONE, specified in PARMLIB.	MVS will use TIMEZONE, specified in PARMLIB.	ETRZONE default is Y when ETRMODE is Y.
ETRZONE N	No	MVS will use TIMEZONE, specified in PARMLIB.	MVS will use TIMEZONE, specified in PARMLIB.	ETRZONE default is Y when ETRMODE is Y.
SIMETRID	Yes	MVS will use TIMEZONE, specified in PARMLIB.	MVS will use TIMEZONE, specified in PARMLIB.	ETRMODE and ETRZONE are ignored and the TIMEZONE parameter is used.

Table 16 (Page 2 of 2). What to expect following an IPL

Configuration		Clock usage		
CLOCKxx	9037 avail ?	Basic Mode	LPAR Mode	Comments
VM Operating System	Yes	At IPL, VM will consider the TOD clock as not set. The TOD clock will need to be set at IPL by the operator.	PR/SM will set the logical TOD clock at LPAR activation from the Sysplex Timer. At IPL, VM may choose to either use the logical TOD clock value or choose to allow the operator to set it.	See "VM/ESA" on page 17.
VM Operating System	No	At IPL, VM will consider the TOD clock as not set. The TOD clock will need to be set at IPL by the operator.	PR/SM will set the logical TOD clock at LPAR activation from the SYSDEF B2 frame (ES/9000 & ES/3090) or from the Service Element (9672). At IPL, VM may choose to either use the logical TOD clock value or choose to allow the operator to set it.	

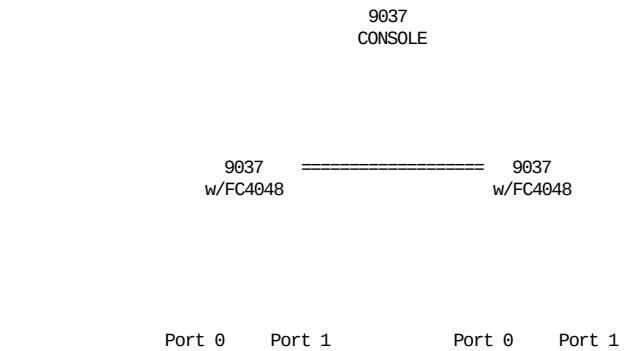
Single-Image Multiprocessor Recovery

Multiprocessors are required to have a Sysplex Timer Attachment Feature on both sides when using a Sysplex Timer. When connecting a 9037 pair to a Single-Image multiprocessor, the fiber optic cables are cross-connected for availability to two Sysplex Timer Attachment Features.

All Sysplex Timer ports are continuously and simultaneously transmitting, but only one Attachment Feature per processor is actively influencing the TOD clock.

On the 9121 511-based multiprocessors and the 9021 711-based multiprocessors, the standby Attachment Feature is ready to immediately become the active side in the event of a failure of the currently active side. Other multiprocessor models must perform a power-on-reset before the active side can be switched.

On all multiprocessor models, the side with the active Attachment Feature is determined at power-on-reset by the active side of the duplex Processor Controller Element (PCE). If the PCE Side-A is active, then the active Attachment Feature is Side-0. If the PCE Side-B is active, then the active Attachment Feature is Side-1.



- Active Side (PCE) at POR determines Attachment Feature used
- One side is the active attachment feature at a time
- Redundancy provided by
  - Backup 9037
  - Backup 9037 Port
  - Backup Attachment Feature Port
  - Backup Attachment Feature
- ***Attachment Feature failure automatic switch-over***
  - PTF for APAR OY65132 required
  - 9021 711-Based MP's only (SEC 228250)
  - 9121 511-Based MP's only (SEC C35936)
  - Other MP's first require a POR and a change to the active PCE side

Figure 38. Expanded Availability SI-Mode Recovery

9121 511-based MP or 9021 711-based MP with two 9037 paths per MP Side:

If there is a complete failure of the processor's active Attachment Feature or when the last available path is down, the other sides Attachment Feature will automatically become the active attachment feature.

Also, if a single-image multiprocessor is being dynamically reconfigured into physically-partitioned mode, the 511-based and 711-based processors will switch the active Sysplex Timer Attachment Feature to the on-going side if it was on the off-going side originally.

9121 511-based MP or 9021 711-based MP with only ONE 9037 path per MP Side:

If you have only one Sysplex Timer path connected to each MP side and if there is a complete failure of the processor's active Attachment Feature or of the Sysplex Timer path, an attachment feature switch-over will occur. If a subsequent power-on-reset is performed before the failed component is repaired, you may not have access to a Sysplex Timer.

In this case, you must first switch the active PCE side prior to a power-on-reset or first repair the Sysplex Timer path. To repeat what was stated earlier, the side with the active Attachment Feature is determined at power-on-reset by the active side of the duplex Processor Controller Element (PCE). If you do not switch the active PCE side before the next power-on-reset, the system will not recognize the alternate Sysplex Timer path available to it.

Note: ***Other multiprocessor models will NOT switch attachment port sides automatically following a failure. Assuming the Sysplex Timer path won't be available to the side, these MP's (3090, 9121 320-based, 9021 340-based, 9021 520-based) must first switch the active PCE side and then power-on-reset before the Sysplex Timer can be used again.***

Year-End Problem

On the last day of the year, 9037s which called an External Time Source (ETS) generated MVS/ESA message IEA272I with reason code 44. This message falsely indicated a time difference between the ETS and the 9037 greater than 4.999 seconds.

This problem was fixed in ECA003 (V2.1).

If you do not have V2.1 installed on your 9037 console, you can work around this problem by powering the console off and back on again. Then, select "Adjust the Time" from the TIME option on the main menu and follow the directions to calculate and apply the adjustment value (function key F6).

Appendix A. What Time is It?

This appendix contains information to help you understand time concepts and the history of time keeping. By understanding these concepts, you can determine how they relate to the operation of the 9037 and S/390 processors.

The following terms will be discussed.

- Greenwich Mean Time (GMT)
- Atomic Time
- Absolute Time (Sysplex Timer Time)
- Universal Time
- Coordinated Universal Time (UTC)
- Leap Seconds
- Daylight Savings Time (DST).

The History of Time Keeping

The experience of time, or of time duration, has received great attention throughout history. Time keeping has progressed from sundials, water clocks, weight-driven clocks, pendulum clocks, spring-driven clocks and watches, electric clocks, to todays atomic clocks. From the earliest times the rotation of the Earth (or apparent location of the Sun in the sky) has been used to establish a uniform time scale. In order to specify a date, using the apparent motion of the Sun as a time scale, days must be counted from some reference date. In addition, a clock is used to measure fractions of a day.

Because of the eccentricity of the Earth′s orbit around the Sun and the inclination of the Earth′s rotation axis, apparent solar time is not a uniform time scale. These effects can, however, be calculated and corrections applied to obtain a more uniform time scale called Mean Solar Time. Universal time, as measured by observations of the stars, is equivalent to Mean Solar Time at the Greenwich Meridian.

Greenwich Mean Time (GMT)

Greenwich Mean Time is the time on the Greenwich meridian, used as the zero or baseline, for longitudinal measurement, according to the Mean Solar Time. GMT was established as the world standard in 1884. In 1928 it was also given the name ***Universal Time***.

Like Greenwich Mean Time, Universal Time is based on the earth′s rotation and does not step at a fixed rate, but speeds up and slows down with the earth′s rotation rate.

Still smaller deviations from uniformity of Universal Time may be traced to events such as the wandering of the Earth′s polar axis, the Earth′s variable rotational speed due to tides and winds, and other periodic fluctuations. As time keeping accuracy has become more and more critical, other time scales based on astronomical observations have been created that account for very small fluctuations in the Earth′s rotation.

Atomic Time

In addition to astronomical time scales, there are other time scales such as atomic time, based on the microwave resonances of certain atoms in a magnetic field. The invention of the atomic clock, based on the measurement of changes in the energy states of atoms, makes measurement of time and frequency more accurate than ever before. The cesium atom clock, which was developed around 1950, is now used as a highly stable laboratory standard and as a frequency source for aircraft navigational systems. Cesium clocks can achieve an accuracy of about one second in every 300,000 years.

Other atomic clocks, using other atomic elements, have been invented that are even more accurate. Such clocks may be accurate to within one second in many thousands or even millions of years. Although atomic frequency standards are too expensive for general use, they can be used as master clocks (MC) for the rest of us.

Coordinated Universal Time (UTC)

Since the early 1960′s, a number of laboratories around the world have cooperated in comparing their atomic time scales leading to the formation of Coordinated Universal Time (UTC) which is now disseminated to the public. In order to keep UTC in agreement with the length of the day, seconds are occasionally added to or subtracted from the atomic time scale. The Sysplex Timer provides a way to do this.

UTC time is a world-wide standard where UTC = Atomic Time ± number of leap seconds since January 1, 1972, 0 a.m.

Daylight Saving Time

Daylight Saving Time (DST) provides more usable hours of daylight for human activities by setting clocks ahead one hour in the spring season. Although the total amount of daylight remains the same, more daylight hours are allowed for outdoor work and recreation in the late afternoon and evening. Daylight Saving Time can also reduce power requirements for lighting. Today, daylight savings time is in effect only during that part of the year when daylight hours are the longest. Congress fixed this period as extending, as of 1987, from the first (previously the last) Sunday in April to the last Sunday in October.

To summarize, daylight savings time adjustments in the United States are

- in the spring (forward one hour) - First Sunday in April
- in the fall (back one hour) - Last Sunday in October.

Leap Seconds

Just as leap years were established to compensate for the inconsistent orbits of the earth around the sun, leap seconds ensure that the sunrise and sunset occur at the same time on individual dates every year. Leap years make adjustments to calendars, and leap seconds make adjustments to the number of seconds in a year. This came about due to the invention of atomic clocks which measure intervals very accurately. Since the rotation of the earth is not as precise, leap seconds are needed.

The following list shows the leap seconds that have been added since June 30, 1972 when the practice was begun.

- June 30, 1972 (+1)
- December 31, 1972 (+1)
- December 31, 1973 (+1)
- December 31, 1974 (+1)
- December 31, 1975 (+1)
- December 31, 1976 (+1)
- December 31, 1977 (+1)
- December 31, 1978 (+1)
- December 31, 1979 (+1)
- June 30, 1981 (+1)
- June 30, 1982 (+1)
- June 30, 1983 (+1)
- June 30, 1985 (+1)
- December 31, 1987 (+1)
- December 31, 1989 (+1)
- December 31, 1990 (+1)
- June 30, 1992 (+1)
- June 30, 1993 (+1)
- June 30, 1994 (+1)

When will there be a Leap Second ?

Leap second adjustment information can be obtained from the National Institute of Standards and Technology (NIST). You can request, by mail, a regularly published government document which announces leap second adjustments (typically in June and/or December). To obtain the document, request a subscription of the ***Time & Frequency Bulletin***.

U.S. Department of Commerce
National Institute of Standards and Technology
Time & Frequency Division
Boulder, Colorado 80303

The National Institute of Standards and Technology provides a service, called ACTS, which automatically inserts leap seconds into their time signal when they occur. For example, when a leap second is added, the sequence of timestamps will look like this...

```
23:59:57
23:59:58
23:59:59  -> June 30th
23:59:60  -> June 30th leap second
00:00:00  -> July 1st
00:00:01
00:00:02
```

ACTS will send the ″extra″ second. When using ACTS as a 9037 external time source, MVS/ESA will hide the extra second so the MVS timestamps will appear normal, but the extra second will have been added to the day. On 9037 Expanded Availability configurations or Basic 9037 configurations with RPQ 8K1787, the extra second will be added and slowly ″steer″ MVS/ESA to the corrected time.

Should I specify Leap Seconds or ignore them?

If you have specific requirements to provide accurate time (relative to some standard time) then you should specify and continue to schedule leap seconds. Some examples of such specific requirements might be legal or contractual requirements for timestamps to be within some tolerance of NIST Time, or if timestamps are used for time dependant banking, scientific or navigational purposes.

If your installation has no such requirements, the use of leap seconds is optional.

Sysplex Timer Time (absolute time)

In defining an architecture to meet ESA/390 time-coordination requirements, it was necessary to introduce a new kind of time reflecting the evolution of international time standards, yet remaining consistent with the original TOD clock definition. Until the advent of the Sysplex Time architecture, the TOD clock value had been entered manually, and the occurrence of leap seconds had been essentially ignored. Introduction of the Sysplex Timer architecture has provided a means whereby TOD clocks can be set and stepped very accurately, on the basis of an external time source, so the existence of leap seconds cannot be ignored.

Several requirements influenced the definition of Sysplex Timer time:

- Since the TOD clock is directly available to application programs, the definition of Sysplex Timer time must be consistent with the current definition of the TOD clock.
- The TOD clock format was designed to be suitable for performing arithmetic; that is, subtracting two TOD clock values must provide an accurate measure of time interval. To meet this requirement, Sysplex Timer time must be strictly monotonic, with no discontinuities. It is defined in terms of atomic seconds.
- The TOD clock value is defined to represent the number of atomic seconds since the epoch (originally defined in terms of GMT). To avoid the necessity of determining the number of atomic seconds that have occurred between 0 a.m. January 1, 1900 GMT and 0 a.m. January 1, 1972 UTC (when the process of adding leap seconds began), the TOD epoch was redefined as January 1, 1900, 0 a.m. Sysplex Timer time.

  Sysplex Timer time (sometimes referred to as absolute time) was defined to be equal to UTC on January 1, 1972, 0 a.m.

S/390 TOD Clock

Before MVS/ESA Version 4 and Version 5, MVS was concerned with only two times, GMT and local time. These two times differed by a fixed amount, which was usually subject to change only twice a year, when going from standard time to daylight savings time and back again. Starting with MVS/ESA Version 4, MVS can be dealing with up to three distinct representations of time:

- Sysplex Timer Time (absolute time)
- Coordinated Universal Time (UTC) which is Absolute Time plus or minus the leap seconds accumulated since 1972.

- Local Time, which is UTC plus or minus a fixed offset.

Of the three time representations, only absolute time offers consistent monotonically increasing time values. Both UTC and local time occasionally skip or repeat time values. For this reason, absolute time is the best choice for applications that have to unambiguously timestamp their data (as in logging).

Even though the user can enter any initial time into the Sysplex Timer, the Sysplex Timer treats that time as absolute time. Therefore the CPC TOD clock is also set to absolute time.

In addition to the absolute time, the Sysplex Timer also provides offset information for leap seconds and local time to the CPC. The offset information is used by an operating system to calculate the correct values for UTC and local time. The offsets can be scheduled by the Sysplex Timer and transmitted to the CPC. On some processor models, the CPC then immediately interrupts the operating system to inform it of the offset changes. (Other processors may not notice the offset change for several minutes. See “SETETR” on page 15.) MVS/ESA V4 or higher can then automatically adjust it′s own offsets to reflect the change. Thus, it is not necessary to issue a SET CLOCK command or to IPL the system to change from standard time to daylight savings time, for example.

Note that while the offset adjustments are taking place, no adjustment is being made to the TOD clock or to the absolute time running in the Sysplex Timer. Separate adjustments to the TOD clock are made only when it is determined to be out of synchronization with the Sysplex Timer.

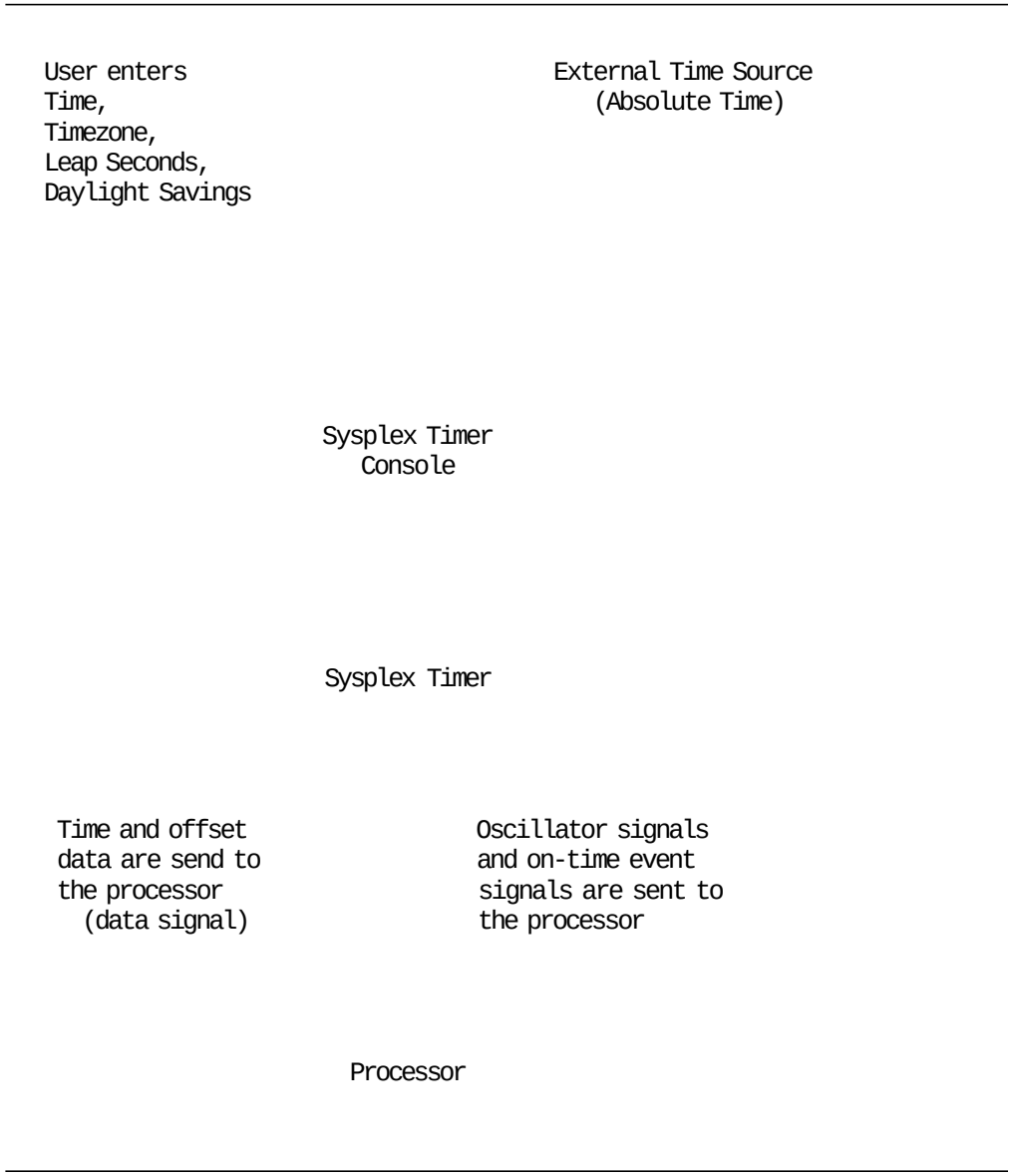


Figure 39. Sysplex Timer Data Flow

MVS/ESA Time

As mentioned, MVS/ESA V4 and V5 keeps up to three separate representations of time:

- Absolute Time
- Coordinated Universal Time (UTC or GMT)
- Local Time.

MVS/ESA controls this time representation with the CLOCKxx member in SYS1.PARMLIB.

If you do not specify ETRMODE Y, TOD representations in MVS are the same as in pre-Version 4 releases. If you specify ETRMODE Y, MVS can display up to three distinct ″times″ at any particular moment.

The Time of Day (TOD) clock value, is used frequently within the MVS operating system environment. The way in which these timestamps are to be used fall into the following categories.

1. The most obvious use is to obtain the correct date and/or time of day. The date and time may be either local time and date or Greenwich Mean time (GMT) and date.
2. Timestamps are frequently used as a mechanism to ensure the correct ordering of entries in logs, data records, or recovery records.
3. TOD clock values are used to calculate the time interval between two events.
4. TOD clock values are used create a unique identifier.

The use to which a TOD clock value is to be put determines the methods which can be used to obtain the TOD value. Note that the method required for one use usually is not sufficient for another use. It is especially dangerous to attempt to obtain time of day values by issuing the STCK instruction. The TOD clock value returned is NOT necessarily GMT. If MVS is using a Sysplex Timer, it may be an ″absolute time″ value instead.

Listed below are the several uses made of timestamp values and the ways to obtain them from MVS. The TIME macro is the recommended method to obtain times of day for the reasons listed under “Warning” on page 116.

Method	Local Time	GMT Time	Order-ing	Interval	Unique ID
STCK	N	N	**Y**	**Y**	**Y**
STCK + LTO	N	N	N	N	N
STCK - LSO	N	**Y**	N	N	N
STCK - LSO + LTO	**Y**	N	N	N	N
TIME macro UNIT=STCK	N	N	**Y**	**Y**	**Y**
TIME macro ZONE=LT	**Y**	N	N	N	N
TIME macro ZONE=GMT	N	**Y**	N	N	N

where:

STCK means the STCK instruction or the STCKSYNC macro.

LTO is the local time offset value. The whole doubleword value is contained in CVTLDTO. CVTTZ contains only the high word.

LSO is the leap second offset value. The doubleword value is contained in CVTLSO.

Warning

Starting with MVS Version 4:

A STCK value does NOT necessarily equal GMT. STCK values may differ from the true GMT value by 19 or more seconds (leap seconds). This difference will increase over time.

A STCK value plus the LTO does NOT necessarily equal the Local time value. This value may differ from the true local time by 19 or more seconds. This difference will increase over time.

Appendix B. 9037 Log - Reason Codes

9037 Reason Codes

All messages appearing in the event log or displayed at the 9037 console are preceded by a number referred to as the reason code (RC). The reason codes are primarily used by the IBM Service Representative to determine corrective actions to be taken. Corrective actions are described in the 9037 Maintenance Information handbook - SY27-2605. This table contains a description of the reason codes.

Many of these reason codes are associated with MVS message IEA272I. This message can be found at “IEA272I” on page 125 and in the MVS/ESA Messages manual.

Note

Not all processor models will generate the IEA272I message with its corresponding Reason Code=rcc. For example, the 9021 340-based (330, 340, 500, 580, 620, 720) models, the 9121 320-based (180,190, 210, 260,320, 440, 480, 490, 570, 610) models, and the 3090 J/T (all) models will *NOT* surface this message. All other Sysplex Timer supported models *WILL* surface this message.

Table 17 (Page 1 of 3). Event Log Reason Codes

Reason Code	Description
RC000	No errors
RC001	Log Marker
RC002	Operation failed. Modem not responding
RC003	Time out waiting for phone line connection
RC004	Phone line data transfer failed
RC008	Communication established with console
RC012	Base Cards are at different internal code levels
RC013	Control Link Cards are at different internal code levels
RC014	Base Cards are at incompatible internal code levels
RC015	Control Link Cards are at incompatible internal code levels
RC016	Port 0 receiving valid data
RC017	Port 1 receiving valid data
RC018	Port 2 receiving valid data
RC019	Port 3 receiving valid data
RC020	Port 4 receiving valid data
RC021	Port 5 receiving valid data
RC022	Port 6 receiving valid data
RC023	Port 7 receiving valid data

Table 17 (Page 2 of 3). Event Log Reason Codes	
RC024	Port 8 receiving valid data
RC025	Port 9 receiving valid data
RC026	Port 10 receiving valid data
RC027	Port 11 receiving valid data
RC028	Port 12 receiving valid data
RC029	Port 13 receiving valid data
RC030	Port 14 receiving valid data
RC031	Port 15 receiving valid data
RC036	Control links wrapped
RC037	Non-severe fan failure detected
RC038	Maintenance Mode set
RC039	Maintenance Mode cleared
RC040	Communication lost with console
RC042	The 9037 is tracking the external time source (first successful dial-out)
RC044	The external time source is out of tracking range
RC045	The external time source is not responding
RC048	Port 0 receiver detected errors
RC049	Port 1 receiver detected errors
RC050	Port 2 receiver detected errors
RC051	Port 3 receiver detected errors
RC052	Port 4 receiver detected errors
RC053	Port 5 receiver detected errors
RC054	Port 6 receiver detected errors
RC055	Port 7 receiver detected errors
RC056	Port 8 receiver detected errors
RC057	Port 9 receiver detected errors
RC058	Port 10 receiver detected errors
RC059	Port 11 receiver detected errors
RC060	Port 12 receiver detected errors
RC061	Port 13 receiver detected errors
RC062	Port 14 receiver detected errors
RC063	Port 15 receiver detected errors
RC065	Base card failed
RC066	Port card in location 2 failed (ports 0, 1, 2, 3)
RC067	Port card in location 3 failed (ports 4, 5, 6, 7)
RC068	Port card in location 4 failed (ports 8, 9, 10, 11)
RC069	Port card in location 5 failed (ports 12, 13, 14, 15)
RC074	Control Link card failed
RC075	Severe fan failure detected
RC076	Other 9037 unit failed

Table 17 (Page 3 of 3). Event Log Reason Codes	
RC077	Control link A failed
RC078	Control link B failed
RC079	Internal Bus failed
RC080	Battery clock module failed
RC081	Wrong card in card location XX
RC082	Backup data invalid
RC084	Identical Unit Addresses on the Base cards
RC085	Invalid Configuration. The two 9037 units are not linked.
RC096	Diagnostic data (8 bytes). This data can be ignored (RETAIN TDR H093681).
RC104	Port 0 failed
RC105	Port 1 failed
RC106	Port 2 failed
RC107	Port 3 failed
RC108	Port 4 failed
RC109	Port 5 failed
RC110	Port 6 failed
RC111	Port 7 failed
RC112	Port 8 failed
RC113	Port 9 failed
RC114	Port 10 failed
RC115	Port 11 failed
RC116	Port 12 failed
RC117	Port 13 failed
RC118	Port 14 failed
RC119	Port 15 failed
RC129	Console powered on
RC130	Offset Schedule Changed
RC131	Time was ″SET″
RC132	Password changed
RC134	Port control changed
RC140	Authorization level changed
RC141	Time Adjustment Set
RC143	Password installed
RC144	Password protection removed
RC149	External Time Source profile changed
RC260	Console cannot establish communication with 9037 units.
RC268	9037 not initialized

Appendix C. MVS/ESA Messages

This appendix first lists the IEA prefixed messages which are displayed by MVS/ESA, followed by IXC prefixed messages which are displayed by Cross-system Coupling Facility (XCF) component of MVS.

Note: ″ETR″ is the MVS generic name for the IBM 9037 Sysplex Timer and is used frequently in MVS messages.

MVS will provide messages indicating the status of the Sysplex Timer. You should become familiar with these messages ***before*** they are encountered. Take the time to understand the situation that you′re facing before taking drastic action. Sometimes the operating environment can survive a Sysplex Timer outage if the Sysplex Timer connection is reestablished in a reasonable amount of time. While considering a contingency plan, review “Sysplex Timer Failure” on page 104.

This section contains examples of MVS messages as a convenience to you. Each message number and its text is followed by the explanation, system action taken, and recommended operator action.

IEA259I

IEA259I CLOCKxx: ENVIRONMENT NOT VALID FOR SIMETRID

Explanation: The SIMETRID parameter was incorrectly specified in a CLOCKxx parmlib member. The SIMETRID parameter is only valid when the system is running as a virtual machine (VM) or processor resource/systems manager (PR/SM) guest.

In the message text: CLOCKxx The parmlib member, with the suffix xx.

System Action: The system ignores all CLOCKxx parmlib members. The system issues message IEA906A, asking for another CLOCKxx parmlib member or to enter EOB (end of block).

Operator Response: Reply to message IEA906A. If you press the enter button in reply to message IEA906A (EOB), the system sets the following default values:

- No operator prompting for time-of-day (TOD) clock initialization.
- External Time Reference (ETR) synchronization mode.
- ETRDELTA value of 10 seconds.
- Time zone constant obtained from ETR (or set to 0 if time zone cannot be obtained from ETR).

System Programmer Response: Specify the correct synchronization mode (ETRMODE) in the CLOCKxx parmlib member.

If you specify ETRMODE NO, you cannot specify ETRZONE YES.

IEA260I

IEA260I THE CPC IS NOW OPERATING IN ETR MODE.

Explanation: The central processing complex (CPC) is now synchronized with the External Time Reference (ETR).

System Action: Processing continues in ETR synchronization mode.

IEA261I

IEA261I NO ETR PORTS ARE USABLE. CPC CONTINUES TO RUN IN LOCAL MODE.

Explanation: There is no operational port from the central processing complex (CPC) to the External Time Reference (ETR).

System Action: Processing continues in local synchronization mode. The system records the error in the logrec data set.

Operator Response: Check the system console associated with this processor to determine if a service call has been placed. If you have already contacted the IBM Support Center, no further action is required.

Otherwise, contact 9037 hardware support. Note that the same event might occur on more than one of the processors in a sysplex.

IEA262I

IEA262I ETR PORT n IS NOT OPERATIONAL.

Explanation: The specified External Time Reference (ETR) port is not working.

In the message text: n The port number.

System Action: The system continues processing. The system records the error in the logrec data set.

Operator Response: One of the following:

- If an ETR is installed, check the system console associated with this processor. If you have already contacted the IBM Support Center, no further action is required.
- Otherwise, contact 9037 hardware support. Note that the same event might occur on more than one of the processors in a sysplex.
- If an ETR is not installed, ensure that the CLOCKxx member of SYS.PARMLIB contains ETRMODE NO and ETRZONE NO.

Note: This message will appear if only one 9037 port is attached to the processor. MVS/ESA V5.2 will initiate a service call, perhaps unnecessarily.

IEA263I

IEA263I BOTH CPC PORTS ARE CONNECTED TO THE SAME SIDE OF ETR xx.

Explanation: Both central processing complex (CPC) ports are connected to the same 9037 in a configuration with 2 9037′s.

In the message text: xx The ETR identifier.

System Action: The system continues processing. The system records the error in the logrec data set.

Operator Response: Contact your configuration/cabling personnel and have the configuration error corrected. Provide the logrec data set error records.

IEA264I

IEA264I PORT n TO ETR xx WAS DISABLED BECAUSE IT IS INCORRECTLY CONNECTED.

Explanation: The system disabled the specified port to an External Time Reference (ETR). The port was not connected to the same ETR as the link from the remaining or initial port.

In the message text: n The port number.

xx The ETR identifier. If a question mark appears, there was no ETR identifier available from the port.

System Action: The system continues processing. The system records the error in the logrec data set.

Operator Response: Contact your configuration/cabling personnel and have the configuration error corrected. Provide the logrec data set error records.

IEA265I

IEA265I UNABLE TO SYNC TOD CLOCKS TO ETR. CPC CONTINUES IN LOCAL MODE.

Explanation: The central processing complex (CPC) could not synchronize with the External Time Reference (ETR). This occurred for one of the following reasons:

- The time difference between the ETR and time-of-day (TOD) clocks exceeded the ETRDELTA value in the active CLOCKxx parmlib member.
- A hardware error occurred.

System Action: The system continues processing in local synchronization mode. The system records the error in the logrec data set.

Operator Response: Contact hardware support. Provide the logrec data set error records.

IEA266I

IEA266I CLOCKxx: {ETRMODE NO AND ETRZONE YES|OPERATOR PROMPT AND SIMETRID} ARE MUTUALLY EXCLUSIVE PARMS.

Explanation: Both ETRMODE NO and ETRZONE YES, or OPERATOR PROMPT and SIMETRID, were specified in a CLOCKxx parmlib member. The timer synchronization mode must be External Time Reference (ETR) (ETRMODE YES) to obtain the time zone value from the ETR.

In the message text: CLOCKxx The parmlib member, with the suffix xx.

System Action: The system ignores all CLOCKxx parmlib members. The system issues message IEA906A.

Operator Response: Reply to message IEA906A. If you press the enter button in reply to message IEA906A, the system sets the following default values:

- No operator prompting for time-of-day (TOD) initialization.
- ETR synchronization mode.
- ETRDELTA value of 10 seconds.
- Time zone constant obtained from ETR (or set to 0 if time zone cannot be obtained from ETR).

System Programmer Response: Specify the correct synchronization mode (ETRMODE) in the CLOCKxx parmlib member.

If you specify ETRMODE NO, you cannot specify ETRZONE YES.

IEA267I

IEA267I ETR PORT n IS NOW AVAILABLE.

Explanation: An External Time Reference (ETR) port is now working.

In the message text: n The port number.

System Action: The system continues processing.

IEA268I

IEA268I ETR PORT n IS DISABLED DUE TO AN EXCESSIVE NUMBER OF STATE CHANGES.

Explanation: The system detected an excessive number of availability state changes for an External Time Reference (ETR) port.

In the message text: n The port number.

System Action: The system disables the port.

Operator Response: Check the system console associated with this processor to determine if a service call has been placed. If you have already contacted the IBM Support Center, no further action is required.

Otherwise, contact 9037 hardware support. Note that the same event might occur on more than one of the processors in a sysplex.

IEA269I

IEA269I A CPC SIDE ID CHANGE FROM SIDE x TO SIDE y HAS OCCURRED.

Explanation: The central processing complex (CPC) switched from using the External Time Reference (ETR) ports on one side to the ports on another side.

In the message text: x,y The side identifiers.

System Action: Processing continues.

IEA270I

IEA270I BOTH PORTS TO THE ETR HAVE BEEN DISABLED. CPC CONTINUES IN LOCAL MODE.

Explanation: The system disabled both ports to an External Time Reference (ETR).

System Action: Processing continues in local mode.

Operator Response: Contact your configuration/cabling personnel and have the configuration error corrected. Provide the logrec data set error records.

IEA271I

IEA271I ETR TIME OFFSET CHANGES HAVE OCCURRED.

Explanation: One of the following occurred:

- A leap second increment or decrement
- The local time offset changed because of a change to or from local daylight savings time

System Action: Processing continues.

IEA272I

IEA272I ETR SERVICE IS REQUESTED. REASON CODE=rcc

Explanation: The External Time Reference (ETR) requires service.

In the message text: REASON CODE=rcc

A three digit reason code explaining the error follows.

Note: Some of these codes are informational and require no action by the operator. See “9037 Reason Codes” on page 117 for an explanation of each return code that might appear in this message. The return codes are also documented in the Sysplex Timer 9037 Maintenance manual, SY27-2605 and the MVS/ESA Messages book.

System Action: Processing continues.

Operator Response: If the reason code indicates that service is required, check the system console associated with this processor. If you have contacted the IBM Support Center, no further action is required.

Otherwise, contact 9037 hardware support. Note that the same event might occur on more than one of the processors in a sysplex.

Note

Not all processor models will generate the IEA272I message with its corresponding Reason Code=rcc. For example, the 9021 340-based (330, 340, 500, 580, 620, 720) models, the 9121 320-based (180,190, 210, 260,320, 440, 480, 490, 570, 610) models, and the 3090 J/T (all) models will *NOT* surface this message. All other Sysplex Timer supported models *WILL* surface this message.

IEA273I

IEA273I TOD CLOCKS DYNAMICALLY ADVANCED TO MAINTAIN ETR SYNCHRONISM.

Explanation: After an External Time Reference (ETR) synchronization check, the system synchronized the time-of-day (TOD) clocks again.

The channel path measurement facility (CPMF) stops or enters a restartable error state. The system restarts the CPMF.

System Action: The system continues processing. Resynchronization may have created a gap in timestamps.

IEA274I

IEA274W THE ONLY ONLINE TOD CLOCK HAS FAILED.

Explanation: The last, or only, online time-of-day (TOD) clock failed.

System Action: The system enters non-restartable wait state X′A1E′.

Operator Response: See the operator response for wait state X′A1E′.

System Programmer Response: See the system programmer response for wait state X′A1E′.

IEA275I

IEA275I PRIMARY SYNCHRONIZATION FACILITY DAMAGE WAS DETECTED.

Explanation: The system found that the primary synchronization facility was damaged.

System Action: The system attempts to validate the damaged hardware. The system continues processing.

IEA276I

IEA276I ETR ATTACHMENT DAMAGE WAS DETECTED.

Explanation: The system found that the External Time Reference (ETR) attachment was damaged.

System Action: The system attempts to validate the damaged hardware. The system continues processing.

IEA277I

IEA277I TIMING FACILITY DAMAGE WAS DETECTED.

Explanation: The system found that the time-of-day (TOD) clock or the TOD synchronization facility was damaged.

System Action: The system attempts to validate the damaged hardware. The system continues processing.

IEA278I

IEA278I THE LINK FROM PORT n TO THE ETR IS TUNED.

Explanation: All link segments from the specified port to the External Time Reference (ETR) are tuned. A tuned link is one for which transmission adjustments have been made to account for the length of the link.

In the message text: n The port number.

System Action: Processing continues.

IEA279I

IEA279I ALL CLOCK RELATED SET COMMANDS ARE IGNORED WHEN IN ETR MODE.

Explanation: The operator entered a SET command while the system was running in External Time Reference (ETR) synchronization mode.

System Action: The system ignores the SET command.

IEA280I

IEA280I ETR DATA CANNOT BE ACCESSED. CPC CONTINUES IN LOCAL MODE.

Explanation: One of the following occurred:

- Timer supervision could not obtain the required data words from the External Time Reference (ETR).
- The data words that timer supervision obtained from the ETR are not valid.

System Action: Processing continues in local synchronism mode.

Operator Response: Check the system console associated with this processor to determine if a service call has been placed. If you have already contacted the IBM Support Center, no further action is required.

Otherwise, contact 9037 hardware support. Note that the same event might occur on more than one of the processors in a sysplex.

IEA281I

IEA281I ETR SYNC CHECK THRESHOLD HAS BEEN EXCEEDED. CPC CONTINUES IN LOCAL MODE.

Explanation: The number of External Time Reference (ETR) synchronization checks exceeded the number allowed by the system.

System Action: Processing continues in local synchronization mode.

Operator Response: Contact hardware support. Provide the logrec data set error records.

IEA282I

IEA282I hh.mm.ss ETR STATUS SYNCHRONIZATION MODE=mode CPC SIDE=n

Explanation: In response to the DISPLAY ETR command, the system displays this message.

DISPLAY ETR

```
{CPC PORT 0 {<==} active {==>} CPC PORT 1
      op                    op
      enb                   enb
```

or

DISPLAY ETR,DATA

```
{CPC PORT 0 {<==} active {==>} CPC PORT 1
      op                    op
      enb                   enb
      ETR NET ID=etrnet     ETR NET ID=etrnet
      ETR PORT=etrport      ETR PORT=etrport
      ETR ID=etrid          ETR ID=etrid

  {THE ETR FACILITY IS NOT INSTALLED.}

  {PORT STATUS CANNOT BE DETERMINED.}

  {ETR DATA COULD NOT BE OBTAINED FOR CPC PORT 0}

  {ETR DATA COULD NOT BE OBTAINED FOR CPC PORT 1}
```

In the message text:

- hh.mm.ss = The hour (00-23), minute (00-59), and second (00-59) that the system issued this message.
- mode = The current synchronization mode, as follows:
  - ETR = The system time-of-day (TOD) clocks are synchronized to an External Time Reference (ETR).
  - LOCAL = The operator set the system TOD clocks. The system TOD clocks are synchronized to a local oscillator.
- < = = ==> = An arrow pointing to the active ETR port.
- op = The operational status of the ETR port, as follows:
- OPERATIONAL = The port is working.
- NONOPERATIONAL = The port is not working.
- enb = One of the following:
  - ENABLED = MVS has enabled the port.
  - DISABLED = MVS has disabled the port. The port is disabled.
  - etrnet = The ETR network identifier, in decimal.
  - etrport = The ETR port number, in decimal.
  - etrid = The ETR identifier, in decimal.

THE ETR FACILITY IS NOT INSTALLED = There is no ETR installed on the system.

PORT STATUS CANNOT BE DETERMINED = The system cannot communicate with the ETR.

System Action: The system continues processing.

IEA283I

IEA283I ETR PORT n IS ENABLED.

Explanation: An External Time Reference (ETR) port is enabled. This is the same response to the SETETR PORT=n command.

In the message text: n The port number.

System Action: The system continues processing.

IEA284I

IEA284I ETR PORT n CANNOT BE ENABLED.

Explanation: The system cannot enable an External Time Reference (ETR) port for one of the following reasons:

- The installation requested local synchronization mode, meaning that ETR ports must be disabled.
- The ETR Facility is not installed.
- The system cannot communicate with the ETR.

In the message text: n The port number.

System Action: The system continues processing.

Operator Response: Do the following:

- Wait 30 seconds.
- Enter the SETETR command again.

If the system issues message IEA284I again, the port cannot be enabled.

Enter the DISPLAY ETR command to display information about the port.

IEA285I

IEA285I THE LINK FROM PORT n TO THE ETR IS NOT TUNED.

Explanation: One or more link segments in the path from the specified port to the External Time Reference (ETR) are not tuned. An untuned link has had no transmission adjustments made to account for its length.

In the message text: n The port number.

System Action: Processing continues normally, unless a resynchronization of the time-of-day (TOD) clock is required. If a resynchronization is required, the system will switch to a tuned port or to local synchronization mode.

ICX402D

IXC402D sysname LAST OPERATIVE AT hh mm ss. REPLY DOWN text

Explanation: XCF determined that a system in the sysplex appears to be inoperative.

In the message text:

sysname

The name of the inoperative system in the sysplex.

hh mm ss

The last time XCF could detect that the system was functioning. The time is in hours (00-23), minutes (00-59), and seconds (00-59).

IF MVS IS DOWN OR INTERVAL=SSSSS TO SET A REPROMPT TIME.

OR ISOLATE OR INTERVAL=SSSSS TO SET A REPROMPT TIME.

System Action: Processing continues. If the operator replies DOWN, XCF starts removing system sysname from the sysplex.

Operator Response: Choose one of the following replies:

- DOWN

  To specify that XCF remove system sysname from the sysplex.

- INTERVAL=sssss

  To request that system monitoring continue and the operator be reprompted, if system sysname does not become active within the specified interval. The interval, sssss, must be in seconds and in the range of 0 to 86400 seconds (24 hours).

If the reply is incorrect, the system issues message IXC208I to notify the operator of the error. Then the system issues message IXC402D again.

ICX406I

IXC406I THIS SYSTEM IS CONNECTED TO ETR NET ID=xx. THE OTHER ACTIVE SYSTEMS IN THE SYSPLEX ARE USING ETR NET ID=yy.

Explanation: During sysplex initialization, cross-system coupling facility (XCF) determined that the system joining the sysplex is using a different XCF external time reference (ETR) clock than the other systems in the sysplex. All systems in a sysplex must use the same ETR clock.

In the message text:

xx The identifier of the ETR clock used by the IPLing system.

If the IPLing system is not using an ETR, the message text contains NET ID=LOCAL.

yy The identifier of the ETR clock used by the other systems in the sysplex.

System Action: The system restarts XCF and issues message IXC207A to request a new COUPLExx specification.

Operator Response: Check the status of the ETR and notify the system programmer.

System Programmer Response: Have the operator do one of the following:

- Specify the COUPLE00 parmlib member on this system to IPL it in XCF-local mode. None of the multisystem XCF services will be available.
- Request a different COUPLExx parmlib member to specify a different couple data set.
- Correct any ETR problem and retry with the same COUPLExx parmlib member.

- Enter a VARY XCF command to remove any systems in the sysplex that are not connected to the correct ETR clock.

If the problem persists, search problem reporting data bases for a fix for the problem. If no fix exists, contact the IBM Support Center.

ICX407W

IXC407W XCF IS UNABLE TO CONTINUE: WAIT STATE CODE: 0A2 REASON CODE: 00C. XCF HAS LOST ACCESS TO THE EXTERNAL CLOCK. IF YOU RESTART THIS SYSTEM, ALL OTHER SYSTEMS IN THE SYSPLEX WILL BE PLACED IN A WAIT STATE. RESTART THIS SYSTEM TO CONTINUE.

Explanation: This system lost access to the cross-system coupling facility (XCF) external time reference (ETR) clock. Either the ETR clock failed, or this system′s connection to the ETR clock failed. All systems in the sysplex must use the same ETR clock.

If this message appears on every system in the sysplex, the problem is with the ETR clock itself.

System Action: The system enters a restartable wait state X′0A2′. If this system is not removed from the sysplex, the other systems will fail. The system writes a machine check record for the ETR failure.

Operator Response: Contact hardware support.

System Programmer Response: Do the following:

- If this message appears on every system in the sysplex, there is a problem with the ETR clock itself. Decide which system in the sysplex you want to keep up and respond to message IXC407W on that system by restarting it. The restarted system removes all other systems from the sysplex. All the other systems enter a nonrestartable wait state.
- If this message is not issued on every system in the sysplex, the problem probably involves this system′s connection to the ETR clock. You can keep either this system running or all the other systems running. If you want to keep just this system going, ask the operator to restart it.

In either case, ask the operator to do one of the following:

- Restart this system.

  If the ETR clock is not synchronized when this system is restarted, this system will remove all other systems from the sysplex. All the systems will enter a nonrestartable wait state.

  If the ETR clock is synchronized, this system will rejoin the other systems in the sysplex.
- Do not restart this system.

  If this system is not restarted, another system in the sysplex issues message IXC402D. RESET this system, and reply DOWN to message IXC402D on the other system.

After the ETR clock is fixed, reIPL this system into the sysplex.

ICX411I

IXC411I SYSTEMS CAN NOW ENTER THE SYSPLEX USING SYNCHRONOUS CLOCK ID=id

Explanation: The sysplex switched from timer-local mode to the XCF external time reference (ETR) clock.

In the message text:

id = The identifier of the ETR clock.

System Action: Systems can now form a sysplex using the ETR clock.

Operator Response: Any other systems brought into this sysplex should use the ETR clock.

ICX416I

IXC416I SIMETRID IS SUPPORTED ONLY WHEN ALL SYSTEMS IN THE SYSPLEX ARE RUNNING ON THE SAME CPC

Explanation: This system tried to use a simulated external time reference identifier (SIMETRID) in a sysplex that does not support it. This could mean one of the following:

- A system running on MVS tried to use SIMETRID, specifying incorrect SIMETRID.
- Systems running as a guest on a Virtual Machine (VM) system do not all have CPUIDs that represent the same system.
- Systems running in a Processor Resource/Systems Manager (PR/SM) environment are not all on the same side of a physically removed processor complex.

System Action: The system restarts initialization of XCF. The system issues message IXC207A to prompt the operator for a COUPLExx parmlib member.

Operator Response: Notify the system programmer.

System Programmer Response: To use SIMETRID in a sysplex, do one of the following:

- Make sure that this system should be part of this sysplex. If not, specify the COUPLExx parmlib member for the correct sysplex.
- If the systems are running on VM, make sure that the processor identifiers (CPUIDs) of all the systems on the sysplex represent the same machine. The VM systems must be on the same side of a physically partitioned machine.
- If the systems are running in a PR/SM environment, make sure all the systems in the sysplex are on the same side of a physically removed processor complex.

For any system to use SIMETRID, all the systems in the sysplex must use SIMETRID.

If this system should not be using SIMETRID, change the SIMETRID parmlib specification in the CLOCKxx parmlib member.

ICX462W

IXC462W XCF IS UNABLE TO ACCESS THE ETR AND HAS PLACED THIS SYSTEM INTO NON-RESTARTABLE WAIT STATE CODE: 0A2 REASON CODE: 114

Explanation: This system lost access to the ETR. Either the ETR failed, or ETR connectivity to this system has failed. All systems in the sysplex must use the same ETR.

If this message appears on every system in the sysplex, the problem is probably with the ETR itself.

System Action: The system enters a non-restartable wait state X′0A2′, reason code X′114′. The system writes a machine check record for the ETR failure. If this system is not removed from the sysplex, the other systems may fail. If there are other active systems in the sysplex that did not lose ETR synchronization, then XCF on those systems will detect a status update missing condition for this system. XCF on those active systems will partition this system from the sysplex according to the sysplex failure management policy if such policy exists and is active. Otherwise, XCF will issue message IXC402D to ask the operator whether XCF should partition this system from the sysplex.

Operator Response: Contact hardware support and determine whether to reconfigure the sysplex with assistance from the system programmer.

System Programmer Response: Do the following:

- If this message appears on every system in the sysplex, there is probably a problem with the ETR itself. For this case, XCF can allow only one system to be IPLed back into the sysplex, unless a simulated ETR can be used in which case all systems must be IPLed to run in the same processor in the same physical partition under VM or PR/SM. Determine whether to reconfigure the sysplex and then IPL any systems that will be a part of that sysplex.
- If this message is not issued on every system in the sysplex, the problem is probably an ETR connectivity failure that involves one or more systems. You can choose to continue with the unaffected systems, or you can choose to reconfigure the sysplex as described above, except that you must also carefully consider whether any of the unaffected systems need to be reset first in order to protect data integrity of shared sysplex wide resources. If you choose to continue with the unaffected systems, the affected systems must be partitioned out of the sysplex, either manually by replying to IXC402D, or automatically as a result of an installation sysplex failure management policy.

Appendix D. TPF Messages

This appendix lists various Sysplex Timer messages related to Transaction Processing Facility. More detail can be found in the TPF Messages manual, SH31-0156.

Note: ″STR″ is used by TPF as a generic name for the IBM 9037 Sysplex Timer.

00067A

Error Message: UNABLE TO CONFIRM WITH EXTERNAL CPC -- SYNCHRONIZED LOCALLY

Explanation: The message occurred for one of the following reasons:

- An unsuccessful attempt was made to set the time-of-day (TOD) clock to an external synch source.
- Unsuccessful attempts were made to obtain the current TOD clock value from a confirmed CPC. The maximum number of attempts was exceeded.

System Action: The CPC is synchronized locally.

User Response: Ensure that the cabling to the external synchronization source (Sysplex Timer (STR) or time-of-day (TOD) RPQ) is correct. Also, ensure there is another confirmed processor in the complex and that the master processor is synchronous.

00067B

Error Message: CPC(S) CLOCKS CANNOT BE LOCALLY SYNCHRONOUS

Explanation: A time-of-day (TOD) synch check occurred and the CPC could not be synchronized locally for one of the following reasons:

- The CPC is not connected to either a TOD RPQ or a Sysplex Timer. Therefore, the synchronization check indicates the clocks within the CPC are not synchronous internally.
- The CPC is connected to either a TOD RPQ or STR and several unsuccessful attempts were made to synchronize the CPC locally after the TOD synchronization check occurred.

System Action: A catastrophic system error is issued.

User Response: Contact your IBM service representative to correct the TOD clock hardware error.

00067C

Error Message: MASTER TOD CLOCK NO LONGER SYNCHRONOUS

Explanation: While confirming the status of the time-of-day (TOD) clock for this CPC, the TOD clock for the master processor was found to be out of synch with the complex.

System Action: The TOD clock is not confirmed until a ZATIM TOD functional message is issued by the operator.

User Response: Issue a ZATIM TOD functional message to confirm the TOD clock.

ATIM0070E

ATIM0070E INVALID REQUEST -- COMPLEX NOT USING STR TIME

Explanation: A ZATIM xxxx STR GOOD functional message was issued on a processor to resynchronize it back into a complex that is using the Sysplex Timer (STR) as the synchronous source and the time value from the STR. However, the request is rejected because it found that the complex is not using the time value from the STR (for example, a ZATIM xxxx TOD hhmmss ddmmyy functional message or a ZATIM xxxx TOD GOOD functional message may have been used when establishing the synchronous source in the complex).

System Action: None.

User Response: Do one of the following:

- IPL the processor to establish synchronization with the complex
- Issue a ZATIM xxxx TOD STR functional message to set the complex with the time value obtained from the STR.

ATIM0071T

ATIM0071T CTKI RETRIEVAL ERROR; UNABLE TO DETERMINE TIME SOURCE

Explanation: Keypoint I (CTKI) could not be retrieved and the system is unable to determine whether the complex was synchronized to the time of the Sysplex Timer (STR).

System Action: None.

User Response:

1. Determine why CTKI could not be retrieved from disk.
2. Correct the problem.

ATIM0078E

ATIM0078E DATE MUST BE LATER THAN MAY 11, 1971

Explanation: Either the date specified through the time-of-day (TOD) message or the date retrieved from the Sysplex Timer (STR) was not later than the date allowed by the high-order bits in the TOD clock (May 11, 1971). clock.

System Action: None.

User Response: Do one of the following:

- Issue the ZATIM functional message again with the proper date
- Change the date on the Sysplex Timer (STR).

ATIM0080T

ATIM0080T INVALID PARAMETER IN ZATIM TSC REQUEST

Explanation: One of the following problems occurred in the input message:

One of these required parameters is missing or specified incorrectly.

- STRNM
- NETID
- STRID
- SSA

System Action: None.

User Response: Issue the ZATIM TSC functional message again in the correct format.

ATIM0081T

ATIM0081T ZATIM TSC REQUEST IS ONLY ALLOWED ON AN HPO SYSTEM

Explanation: The time-of-day (TOD) synchronization compatibility (TSC) hardware is only intended for use on a loosely coupled system where there are CPCs capable of being directly attached to a Sysplex Timer (STR) and CPCs that require the TOD RPQ in the complex at the same time. Because this is not a loosely coupled system, the ZATIM TSC functional message is rejected.

System Action: None.

User Response: None.

ATIM0082I

ATIM0082I TOD SYNCHRONIZATION COMPATIBILITY (TSC) INFORMATION ADDED TO CTKI

Explanation: This message indicates the successful completion of the ZATIM TSC request. The time-of-day (TOD) synchronization compatibility (TSC) information was added to Keypoint I. The Sysplex Timer (STR) can now be used as a synchronization source. For TOD RPQ processors connected to an STR through the TSC hardware, the STRNM parameter must be included in the ZATIM TOD functional message.

System Action: None.

User Response: None.

ATIM0083T

ATIM0083T CTKI RETRIEVAL ERROR; UNABLE TO ADD TOD SYNCHRONIZATION COMPATIBILITY (TSC) INFORMATION.

Explanation: An unsuccessful attempt was made to retrieve Keypoint I using the CYYM keypoint retrieval program. This occurred during processing of a ZATIM TSC functional message.

System Action: None.

User Response: Determine the cause of the CTKI error and correct it.

ATIM0084T

ATIM0084T NO AVAILABLE ENTRIES IN CTKI; UNABLE TO ADD TOD SYNCHRONIZATION COMPATIBILITY (TSC) INFORMATION

Explanation: The synchronization selection address (SSA) specified in the ZATIM TSC functional message does not exist in Keypoint I (CTKI) The time-of-day (TOD) synchronization compatibility (TSC) information cannot be added to CTKI because all the entries are in use. This problem could occur if an SSA is used in more than one CTKI entry.

System Action: None.

User Response: Issue the ZDFIL functional message to display the TOD Clock Synchronization CPC Identification table at the end of CTKI. If an SSA is being used in more than one table entry, issue the ZAFIL functional message to correct the problem. Then, issue the ZATIM TSC functional message again. Otherwise, issue the ZAFIL functional message to add the TSC information to CTKI.

ATIM0085E

ATIM0085E SOME PROCESSORS NOT IN 1052 STATE

Explanation: All processors in the system must be in 1052 state for a time-of-day (TOD) clock to be set, unless the BP option was specified. The TOD clock is the basis of the other clocks in the system. The other clocks are set with respect to the TOD clock during cycling to NORM state. The loosely coupled master determines the setting on the system TOD clock.

If the BP option is invoked, the loosely coupled master switches to the processor setting the time. The other processors in the loosely coupled system are informed that the TOD clock was reset. Those in 1052 state will reset their times.

System Action: None.

User Response: If this is not a loosely coupled system, cycle the system to 1052 state and issue the set time request again. If this is a loosely coupled system, determine first whether the processor where the set time request was issued is or is to become the master. If it is not to become the master, switch to the processor of the loosely coupled master. Use the BP option to force the set time request or cycle all the processors in the system to 1052 state.

ATIM0086E

ATIM0086E CYCLE ALREADY DISABLED IN THIS PROCESSOR

Explanation: The system issues this message when you issue a set time request before a previous set time request finished or some other process disabled the system from cycling.

System Action: None.

User Response: Wait until the previous set time request is finished. If, due to an error condition, there is no previous request outstanding issue the ZPSMS CYCLE ENABLE BP functional message to enable cycling again.

During set time requests, cycling is disabled, so issue the set time request again.

ATIM0087E

ATIM0087E UNABLE TO INHIBIT CYCLE

Explanation: Processing of the set time request was unable to inhibit cycling above 1052 state. The set time request was ended to preserve the integrity of the system clocks.

System Action: None.

User Response: Cycle the system to 1052 state or enable cycling again by issuing the ZPSMS CYCLE ENABLE BP functional message.

ATIM0088E

ATIM0088E CTKI RETRIEVAL ERROR

Explanation: Keypoint CTKI could not be retrieved to update the time-of-day (TOD) clock synchronization fields.

System Action: None.

User Response: Report the problem to your system programmer.

ATIM0089E

ATIM0089E ZATIM TOD VALID ONLY FROM CPU-ID x

Explanation: A time-of-day (TOD) message was issued on a processor that is currently not the master for TOD time and date in a loosely coupled system.

The current master is the processor identified by x.

System Action: None.

User Response: Issue the TOD message again with the BP option on this CPU or issue the message on the processor identified by x.

If the message is issued again on this CPU with the BP option, this processor becomes the master for TOD date and time.

ATIM0090A

ATIM0090A KEYPOINT INDICATES ALL PROCESSORS ARE NOT IN 1052 STATE ENTER 'ZATME CONT' TO CONTINUE OR 'ZATME CNCL' TO CANCEL THE ZATIM REQUEST

Explanation: There are processors in the complex that are above 1052 state.

System Action: None.

User Response: Issue a ZATME CONT functional message to continue the ZATIM TOD operation or issue a ZATME CNCL functional message to cancel the ZATIM TOD request.

ATIM0091E

ATIM0091E INVALID REQUEST -- ALTPORT PARAMETER NOT ALLOWED

Explanation: There are two cases when the ALTPORT parameter is not allowed:

- The request was denied because the only time the active stepping port can be switched is when each port of a CPC goes to a different Sysplex Timer (STR) and these STRs are not coupled. If each port goes to the same STR, there is no need to switch the active stepping port. If each port goes to a different STR and these STRs are coupled, then the time and the synchronization source would be the same in each STR. There is no need to switch the active stepping port.
- When running under PR/SM, the ALTPORT parameter is not allowed on the ZATIM functional message.

System Action: None.

User Response: Issue the ZATIM functional message again without the ALTPORT parameter.

ATIM0092E

ATIM0092E INVALID REQUEST -- STRNM PARAMETER NOT ALLOWED

Explanation: The STRNM parameter is used to specify that the time-of-day (TOD) synchronization compatibility (TSC) hardware is connected to this CPC. In order for the TSC to be connected, the TOD RPQ must exist on this CPC. This message is issued because the TOD RPQ is not present.

System Action: None.

User Response: Issue the ZATIM functional message again without the STRNM parameter.

ATIM0093E

ATIM0093E INVALID REQUEST -- STR PARAMETER NOT ALLOWED

Explanation: The time given by the Sysplex Timer (STR) can only be used to set up the time-of-day (TOD) clocks on CPCs that are directly connected to an STR.

System Action: None.

User Response: Issue the ZATIM functional message again in one of the following formats:

- ZATIM HHMM TOD HHMMSS MMDDYY
- ZATIM HHMM TOD GOOD

ATIM0094A

ATIM0094A UNABLE TO RETRIEVE STR TIME RELIABLY

Explanation: An unsuccessful attempt was made to retrieve the Sysplex Timer (STR) time.

System Action: None.

User Response: Do any of the following:

- Issue the ZATIM functional message again using one of the formats provided in the message.
- Determine whether the CPC stepping port is operational or whether there is a problem with the processor controller on the CPC.
- Call your IBM service representative to investigate the possible problem with the processor controller.

ATIM0095E

ATIM0095E SERIAL NUMBER/SSA NOT FOUND IN CTKI -'STRNM- ' PARM REQUIRED

Explanation: In a loosely coupled complex on a CPC with a time-of-day (TOD) RPQ, a synchronization selection address (SSA) is required. An SSA could not be associated with this CPC because the serial number for the CPC was not found in Keypoint I. However, the TOD synchronization compatibility (TSC) hardware information was found, and therefore, the STRNM parameter was expected on the ZATIM functional message to indicate the port connected to a TSC should be used. Because the STRNM parameter was not included in the input message, no SSA could be assigned.

System Action: None.

User Response: If the CPC is connected to a TSC, issue the ZATIM functional message again with the STRNM parameter. Otherwise, determine why the serial number for this CPC was not found in Keypoint I. The online functional messages ZDKAT and ZDFIL can be used to determine the file address and content of Keypoint I. The ZAFIL message can be used to modify the content of Keypoint I after you have determined the cause of the problem.

ATIM0096W

ATIM0096W SYNC SOURCE SWITCHING FROM STR TO TOD RPQ

Explanation: The master synchronization source was a Sysplex Timer (STR). Because this CPC has a time-of-day RPQ, and the STRNM parameter was not specified on the ZATIM functional message, the TOD RPQ becomes the new synchronization source.

System Action: None.

User Response: If you want the TOD RPQ to be the new synchronization source, then no action is necessary. However, if you want the Sysplex Timer (STR) to remain the synchronization source and this CPC is connected to an STR through the TOD synchronization compatibility (TSC) hardware, issue the ZATIM functional message again with the STRNM parameter. If you want the STR to remain the synchronization source and this CPC is not connected to a TSC, then issue the ZATIM functional message again from another CPC.

ATIM0097E

ATIM0097E STRNM DEFINITION NOT FOUND IN CTKI

Explanation: The name specified in the STRNM parameter was not found in Keypoint I.

System Action: None.

User Response:

1. Specify an STRNM name that is in Keypoint I.
2. Issue the ZATIM functional message again.

ATIM0098E

ATIM0098E BP OR STRNM OPTIONS REQD SINCE STR IS SYNC SOURCE

Explanation: Currently, a Sysplex Timer (STR) is the synchronization source. This CPC has a time-of-day (TOD) RPQ but the STRNM parameter was not specified on the ZATIM functional message.

System Action: None.

User Response: Issue the ZATIM functional message again with the bypass option (BP) to switch the synchronization source from the Sysplex Timer (STR) to the TOD RPQ. Otherwise, issue the ZATIM functional message again with the STRNM parameter to keep the STR as the synchronization source when there is TOD synchronization compatibility (TSC) hardware connected to the CPC.

ATIM0099E

ATIM0099E INVALID NUMBER OF LEAP SECONDS IN CTKI

Explanation: A nonzero value for the number of leap seconds in Keypoint I (CTKI) indicates that the time-of-day (TOD) clock is using absolute time. The ZATIM request was not processed because the number of leap seconds in Keypoint I is greater than 50.

System Action: None.

User Response: Use the ZDKAT and ZDFIL functional messages to determine the file address and content of Keypoint I. The ZAFIL functional message can be used to modify the number of leap seconds in Keypoint I. If a Sysplex Timer (STR) is available, determine the correct number of leap seconds from the STR device panel that displays offsets. After altering Keypoint I, issue the ZATIM functional message.

CLKS0001I

CLKS0001I SYSTEM CLOCK IS NOW SET

Explanation: The system clock was initialized based on an operational time-of-day (TOD) clock.

System Action: The restart procedure continues with an operational TOD clock.

User Response: None.

CLKS0003W

CLKS0003W CTKI RETRIEVAL ERROR

Explanation: Keypoint I (CTKI) could not be retrieved from disk during time-of-day (TOD) clock synchronization. Consequently, the number of leap seconds could not be moved into low core for this CPC. If there is a nonzero value for the number of leap seconds in CTKI, Greenwich Mean Time (GMT) and local standard time calculations are off by the number of leap seconds because CTKI was not retrieved. (A nonzero value for the number of leap seconds in CTKI indicates that the TOD clock is using absolute time.)

System Action: The TOD clock synchronization process is continued.

User Response:

- Determine why CTKI could not be retrieved from disk.
- Correct the retrieval problem.
- Resynchronize the CPC by issuing the ZACOR functional message to correct the value of the number of leap seconds in low core. If a Sysplex Timer (STR) is available, determine the correct number of leap seconds from the STR device panel that displays offsets.

CLKS0005W

CLKS0005W WAITING FOR CPC CLOCK CONFIRMATION

Explanation: The CPC is waiting for confirmation of its time with an external source. This message indicates that the time is required to complete validation of the current clock setting.

System Action: None.

User Response: If this is a loosely coupled system and other confirmed CPCs are available, the time will be confirmed with the other confirmed CPCs. If not, the time must be confirmed by the operator by issuing a ZATIM functional message.

To reset the clock:

1. Issue the ZDTIM SYS functional message to get the current time in the hh.mm format for use in step 2.
2. Do one of the following:
   - Issue the ZATIM HHMM TOD HHMMSS MMDDYY functional message to alter the time-of-day (TOD) clock.
   - Issue the ZATIM HHMM TOD STR functional message to use the time from a Sysplex Timer (STR).

If the TOD Clock Override facility is not present, the ATIM51A PRESS ′TOD ENABLE SET′ KEY TO SYNC CPC TOD CLOCKS message is issued.

CLKS0010I

CLKS0010I TIME OF DAY CLOCK LOCAL STANDARD TIME TIME: hh.mm.ss DATE: mm/dd/yy

Explanation: The current value of the time-of-day (TOD) clock. This message is displayed when the TOD clock is being validated during restart and after it is confirmed with an external time source.

Part of the time value (hhmm) may be used as the baseline value for resetting the time (by issuing the ZATIM functional message).

System Action: None.

User Response: This is purely an information message. No response is required. If the time or date is incorrect, it may be modified by issuing the ZATIM functional message.

CLKS0011A

CLKS0011A THE BSS WILL CHANGE DATE WHEN CYCLED UP TO CONTINUE OR TO CANCEL THE CYCLE UP -- ENTER A ZATME or ZCYCL MESSAGE

Explanation: Issuing the ZCYCL functional message to cycle the basic subsystem (BSS) above 1052 state involves testing the midnight boundary.

System Action: This message is sent to the operator if the BSS will cross a midnight boundary since the last time it was above 1052 state.

User Response: Do one of the following:

- Issue the ZATME GOOD functional message, which allows the BSS to cycle up with the new date.
- Issue the ZATIM SET functional message followed by the ZATME GOOD functional message, which allows the BSS time to be altered while maintaining the old date before continuing.
- Issue the ZATME CNCL functional message, which cancels the cycle request.

CLKS0012A

CLKS0012A SUBSYSTEM ssname WILL CHANGE DATE WHEN CYCLED UP TO CONTINUE OR TO CANCEL THE CYCLE UP - ENTER A ZATME MESSAGE

Explanation: Issuing the ZCYCL functional message to cycle a subsystem above 1052 state results in testing the midnight boundary.

System Action: This message is sent to the operator if the subsystem crosses the midnight boundary since the last time it was above 1052 state.

User Response: Do one of the following:

- Issue the ZATME GOOD functional message, which allows the subsystem to cycle up with the new date.
- Issue the ZATIM SET functional message followed by the ZATME GOOD functional message, which allows the subsystem time to be altered while maintaining the old date before continuing.
- Issue the ZATME CNCL functional message, which cancels the cycle request.

CLKS0012I

CLKS0012I TOD CLOCK stat

Where: stat is one of the following:

1. NOT SET
2. IN ERROR
3. NOT-OP.

Explanation: While trying to convert the time-of-day value for the CLKS0010I message, a store clock instruction has indicated that the TOD clock is in one of the previously listed states. In the case of the IN ERROR display, this indicates a malfunctioning clock hardware error. In the case of the NOT SET display the clock was simply not previously set. This is the case after a power on/reset, for example.

System Action: None.

User Response: If the TOD clock is able to be set after this message is displayed, then any error condition was transient. If not, the TOD clock has a hardware error and your system programmer should be called to investigate the problem.

CLKS0018I

CLKS0018I STR TIME OF DAY LOCAL STANDARD TIME

TIME: hh.mm.ss DATE: mm/dd/yy

Explanation: This is the current time-of-day (TOD) value from the Sysplex Timer (STR). If the time or date is incorrect, it can be modified on the STR.

System Action: None.

User Response: None.

CLKS0046I

CLKS0046I CPC CLOCK(S) LOCALLY SYNCHRONOUS

Explanation: This message occurs when:

- A synchronization check error is encountered but the processor time-of-day (TOD) clocks in error are revalidated successfully. This means that the CPC is internally synchronous. It is not synchronized with a loosely coupled complex but it continues to be locally synchronous.
- A TOD set request on another processor finds this processor in NORM state with internally synchronous clocks. If the clocks are not internally synchronous, the processor is taken down and a catastrophic system error (SE 67B) is issued.
- A ZATIM request fails to synchronize the CPC to an attached Sysplex Timer (STR). This means that the CPC is internally synchronous. It is not synchronized with a loosely coupled complex but it continues to be locally synchronous.

User Response: If the processor is to be confirmed with a remote time source, you can re-IPL or issue the ZATIM functional message. Otherwise, no other action is required.

CLKS0051A

CLKS0051A PRESS 'TOD ENABLE SET' KEY TO SYNC CPC TOD CLOCKS

Explanation: If the time-of-day (TOD) Clock Override facility is not present, the TOD clock must be enabled to set the TOD clock. The architecture of the enable switch varies according to the type of processor. Once pressed, the TOD clock remains enabled for setting for approximately ten seconds. When the set key is not enabled, the TOD clock is known as secure. The TOD clock cannot be set when it is secure.

System Action: None.

User Response: Press the TOD clock enable switch.

CLKS0054W

CLKS0054W NOT ALL PROCESSORS IN 1052 STATE

Explanation: The time-of-day (TOD) clock on this CPC is useable and confirmed. There are no other confirmed TOD clocks in the complex on which to synchronize but there are other processors above 1052 state. External confirmation from the operator is required.

System Action: The CLKS0055A message follows.

User Response: Determine why there are other CPCs in the complex that have unconfirmed TOD clocks, yet are above 1052 state.

CLKS0055A

CLKS0055A ALL OTHER ACTIVE PROCESSORS HAVE UNSYNCED TODS

CURRENT TOD MSTR IS stat ACTIVE CPUID id CPU serial-no

SET THE TOD CLOCK USING THE FORMAT:

'ZATIM HHMM TOD ...'

Where:

stat Blank or NOT depending on the status.
id The CPU ID.
serial-no The serial number of the lowest available I-stream on the current Master.

Explanation: This processor complex could not find another processor complex with which to confirm its time. Consequently, external confirmation from the complex operator is required. The master processor is not confirmed synchronous. If a Sysplex Timer (STR) is available for a synchronization source, then the CLKS87I and CLKS18I messages follow.

System Action: None.

User Response: Issue the ZATIM functional message to confirm the current clock setting.

CLKS0055E

CLKS0055E UNABLE TO SYNC THIS TOD

ALL OTHER ACTIVE PROC′S HAVE UNSYNCED TODS

CURRENT TOD MSTR IS stat ACTIVE CPUID id CPU serial-no

′ZATIM SET TOD′ REQ′D

ENTER FORMAT: ′ZATIM HHMM TOD HHMMSS MMDDYY′

stat Blank or NOT depending on the status.
id The active central processing unit (CPU) ID.
serial-no The serial number for the CPU.

Explanation: This processor complex could not find another processor complex with which to confirm its time. Consequently, external confirmation from the complex operator is required. The master processor is not confirmed synchronous.

System Action: None.

User Response: Issue the ZATIM functional message to confirm the current clock setting.

CLKS0056E

CLKS0056E ZATIM, ENTERED ON CPUID id, HAS RESET TOD CLOCK TO RESYNC THE TOD ON THIS CPU, EITHER REIPL OR CYCLE TO 1052 AND SET TOD CLOCK ON MASTER

Explanation: This message applies to loosely coupled systems only. An interprocessor communications (IPC) message was received that indicates another processor has performed a set time request. The time-of-day (TOD) clock for this processor, therefore, is no longer correct. Automatic resynchronization is prevented because this processor is not in 1052 state.

System Action: None.

User Response: Do one of the following:

- Re-IPL the processor to become synchronous with the loosely coupled complex
- Cycle to 1052 state and set the time again.

CLKS0058E

CLKS0058E TOD SYNC CHECK HAS OCCURRED

Explanation: A confirmed synchronization check has occurred. The instruction streams that took synchronization checks are listed along with the serial number and CPU ID of the master processor (whether the master processor is active) and the master STR information.

System Action: None.

User Response: If the processor is loosely coupled, the processor complex may become internally synchronous. In this case, the processor continues running but will not be synchronous with the external time source.

A re-IPL is required to synchronize the complex in a loosely coupled system.

CLKS0059E

CLKS0059E TOD SYNC CHECK HAS OCCURRED

Explanation: A confirmed synchronization check occurred. The instruction streams that took synchronous checks are listed, along with the synchronization selection address in use at the time, the serial number, and the CPU ID of the master processor, whether the master processor is active, and whether the time-of-day (TOD) RPQ is operational.

System Action: None.

User Response: If the processor is loosely coupled, the processor complex may become internally synchronous. In this case the processor continues running but will not be synchronous with the external time source.

A re-IPL is required to synchronize the complex in a loosely coupled system.

CLKS0082E

CLKS0082E STR ERROR - PORT port number NOT OPERATIONAL

Explanation: During restart, the CPC stepping port was not operational. This port is not able to receive the Sysplex Timer (STR) oscillator signal.

System Action: None.

User Response: See your IBM service representative to investigate the problem.

CLKS0083I

CLKS0083I TWO STRS INSTALLED IN UNCOUPLED MODE

Explanation: Each CPC stepping port on this CPC is connected to a Sysplex Timer (STR) The two STRs are not in high-availability mode because they are uncoupled. One of the ports is disabled. This ensures that fallback does not occur automatically to an STR that is not synchronized with the STR on the primary port.

System Action: None.

User Response: Determine whether the CPC configuration is correct or whether the two STRs should be coupled. If the STRs remain uncoupled, the CLKS87I message is displayed twice (once for the alternate port and once for the primary port). You may then select the STR that you want for the synchronization source. The port connected to the other STR becomes disabled.

CLKS0085E

CLKS0085E STR ERROR -- UNABLE TO READ STR DATA

Explanation: One of the following errors occurred:

- During restart, an unsuccessful attempt was made to read the Sysplex Timer (STR) data, such as the active stepping port, the STR ID, the STR Network ID, or to put the CPC into STR-enabled mode.
- There may be a problem with the processor controller on the CPC.

System Action:

- If the error occurred while trying to read data on the primary port, the CPC is synchronized locally rather than with the STR.
- If the error occurred while trying to read data on the alternate port, the CPC is still synchronized with the STR on the primary port.

User Response: See your IBM service representative to investigate the possible problem with the processor controller.

CLKS0086I

CLKS0086I INCOMPATIBLE WITH MASTER SYNC SOURCE, CPC SYNCHRONIZED LOCALLY

Explanation: This CPC is operating in one of the following scenarios:

- This CPC is directly connected to a Sysplex Timer (STR) but the master synchronization source for the complex is not an STR.
- This CPC is directly connected to an STR and the master synchronization source for the CPC is an STR. However, the STRs present are not the same and they are uncoupled.
- This CPC has a time-of-day (TOD) RPQ, but the master synchronization source for the CPC is an STR, and there is no TOD Synchronization Compatibility (TSC) hardware attached to the STR.

System Action: In any of the previous cases, the CPC is synchronized locally because the CPC is not able to use the master synchronization source.

User Response: Determine whether one of the following problems exists and take the appropriate action:

- If the CPC is attached to the wrong STR, attach the CPC to the correct STR.
- If a ZATIM message was issued that changed the synchronization source from an STR to the TOD RPQ, issue a ZATIM functional message to correct the source of time.
- If there is TSC hardware attached to the STR but the information was not included in Keypoint I, include the TSC hardware information in Keypoint I.

CLKS0087I

CLKS0087I STR AVAILABLE ON type port PORT:

STR ID=str id NETID=network id

Where:

type port The alternate or primary port.

str id The Sysplex Timer (STR) ID.
network id The network ID.

Explanation: The time-of-day (TOD) clock for this CPC is unconfirmed. If this is a loosely coupled complex, there are no other confirmed CPCs. This message is issued to inform you that an STR is available for use as a time and synchronization source. When the message is issued for the alternate port, it indicates that the two CPC stepping ports are connected to two different, uncoupled STRs.

System Action: None.

User Response: If you want to use the STR time, issue the ZATIM functional message with the STR parameter when confirming the TOD clock. The STR is then used automatically as the synchronization source.

If the message is issued for the alternate port, as well as the primary port, and you want to use the STR on the alternate stepping port as the synchronization source, issue the ZATIM functional message with the ALTPORT parameter when confirming the TOD clock. Do not include the ALTPORT parameter if you want to use the STR on the primary stepping port.

CLKS0088E

CLKS0088E STR ERROR -- UNABLE TO READ STR DATA

Explanation: An unsuccessful attempt was made to retrieve the Sysplex Timer (STR) time. Therefore, the STR time could not be displayed on the console.

System Action: None.

User Response: Determine whether the CPC stepping port is operational or if there is a problem with the processor controller on the CPC.

CLKS0089I

CLKS0089I UNABLE TO READ STR ALTERNATE PORT INFORMATION

CANNOT DETERMINE IF THE STR COMPLEX IS IN HIGH AVAILABILITY MODE

Explanation: To determine whether the CPC is connected to two coupled Sysplex Timers (STRs), the STR ID and the STR network ID on each CPC stepping port must be read. Because an unsuccessful attempt was made to read the data on the alternate CPC stepping port, the high-availability mode determination cannot be made. If two STRs are coupled, high-availability mode exists. If the CPC is connected to two uncoupled STRs, then one port is not disabled. Either the CLKS0082E or the CLKS0085E message should accompany this message.

System Action: The system continues the IPL process.

User Response: See your IBM service representative to investigate the problem.

CLKS0090I

CLKS0090I STRID: str id NETWORK ID: network id PORT NUMBER: port number

Explanation: This informational message, which is issued with the CLKS0018I message, provides details about the STR when a ZDTIM STR functional message is issued.

System Action: None.

User Response: None.

CLKS0093I

CLKS0093I STR IS NOT IN HIGH AVAILABILITY MODE

Explanation: This message informs you that both CPC stepping ports are connected to the same Sysplex Timer (STR)

System Action: None.

User Response: Determine whether the configuration is correct or whether each CPC stepping port should be connected to a unique STR.

CQAI0082W

CQAI0082W STR SERVICE IS REQUESTED

Explanation: A Sysplex Timer (STR) external interrupt occurred indicating that service may be required on the STR. The purpose of this request depends upon the STR and is published in IBM Maintenance Information for the 9037 Sysplex Timer.

System Action: The request is logged for the Environmental Error Record Editing and Printing (EREP) program.

User Response: Report this condition to your IBM service representative.

CQAI0083W

CQAI0083W STR TIME OFFSET CHANGES HAVE OCCURRED

Explanation: A Sysplex Timer (STR) external interrupt was received indicating one of the following:

- A leap second increment or decrement occurred
- The local time offset changed because of a change in the local daylight savings time.

The local time offset given by the Sysplex Timer is not used by the TPF system to set the clock.

System Action: The condition is logged for the Environmental Error Record Editing and Printing (EREP) program.

User Response: When you issue a ZATIM functional message to set the time-of-day (TOD) clock, the new leap second offset is used. Follow your local practice for daylight savings time adjustment.

See the console for the Sysplex Timer (STR) for more information.

CQAI0084W

CQAI0084W PORT portnum AVAILABILITY CHANGE OCCURRED

Explanation: The CPC port connected to the Sysplex Timer (STR) has gone from operational to not operational or vice versa. If the primary port and the alternate port started out in synchronization and one of these ports is still operational, then the CPC synchronization is maintained. If none of the ports are operational, CPC synchronization is lost and appropriate error processing occurs.

System Action: STR information is gathered for each of the CPC ports. This information is logged for the Environmental Error Record Editing and Printing (EREP) program.

User Response: Report the port availability problem to your IBM service representative.

CQAI0085I

CQAI0085I STR LINK TUNING CHANGE HAS OCCURRED

Explanation: A change in the tuning status of the ports connected to the Sysplex Timer (STR) occurred.

System Action: STR information is gathered for each of the CPC ports. This information is logged for the Environmental Error Record Editing and Printing (EREP) program.

User Response: Report this condition to your IBM service representative. The CPC may need to be resynchronized by issuing the ZATIM functional message if synchronization is lost within the complex.

CZSA0001E

CZSA0001E SYSPLEX TIMER SYNCHRONISM CHECK

Explanation: The sysplex timer (STR) machine check handler (CZSA) issues this message when a machine check interruption reports an STR synchronism check.

System Action: None.

User Response: None.

DTIM0055T

DTIM0055T INVALID REQUEST -- STR NOT AVAILABLE TO THIS PROCESSOR

Explanation: The user requested to display the Sysplex Timer (STR) time but the processor was not directly connected to an STR.

User Response: Issue the functional message again from a processor that is directly connected to an STR.

DTIM0056T

DTIM0056T UNABLE TO READ STR DATA

Explanation: An unsuccessful attempt was made to retrieve the Sysplex Timer (STR) time when a ZDTIM STR functional message was issued.

Appendix E. World-wide External Time Sources

World-wide Radio External Time Sources

Authorities Responsible for Time Signal Emissions

The following table shows the various Radio Time Sources around the globe. Check with the receiver-provider for compatibility with the three supported Sysplex Timer protocols. The Sysplex Timer protocols are described in detail in the manual titled *Planning For the 9037 Sysplex Timer GA23-0365.*

Table 18 (Page 1 of 2). World Wide Radio External Time Sources

Signal	Authority
ATA	National Physics Laboratory Dr. K.S. Krishnan Road New Delhi - 110012. India
BPM	Shaanxi Astronomical Observatory Academia Sinica P.O. Box 18 - Lintong Shaanxi, China
BSF	Telecommunication Laboratories Directorate General of Telecommunications Ministry of Communications P.O. Box 71 - Chung-Li 32099 Taiwan, R.O.C.
CHU	National Research Council, Time and Length Standards Section Physics Division (M-36) Ottawa K1A OR6, Ontario, Canada
DCF77	Physikalisch-Technische Bundesanstalt, Lab. Zeiteinheit Bundesallee 100 D-3300 Braunschweig Federal Republic of Germany
GDI, Y3S	Amt fur Standardisierung, Messwesen und Warenprufung Zeit - und Frequenzdienst der DDR Furstenwalder Damm 388 DDR 1162 Berlin
EBC	Real Instituto y Observatorio de la Armada San Fernando Cadiz, Spain
HBG	Service horaire HBG Observatoire Cantonal CH - 2000 Neuchatel, Suisse
HLA	Time and Frequency Laboratory Korea Standards Research Institute P.O. Box 3, Taedok Science Town Taejon 305-306 Republic of Korea

Table 18 (Page 2 of 2). World Wide Radio External Time Sources	
IAM	Instituto Superiore delle Poste e delle Telecommunicazioni Ufficio 8°, Rep.2° - Viale Europa 190 00144 - Roma, Italy
IBF	Istituto Elettrotecnico Nazionale Galileo Ferraris Strada delle Cacce, 91 10135 - Torino, Italy
JJY, JG2AS	Standards and Measurements Division Communications Research Laboratory Ministry of Posts and Telecommunications Loganei, Tokyo 184, Japan
LOL	Director Observatorio Naval Av. Espana 2099 1107 - Buenos-Aires, Republica Argentina
MSF	National Physical Laboratory Electrical Science Division Teddington, Middlesex TW11 OLW United Kingdom
OLB5, OMA	Time information: Astronomicky ustav CSAV, Budecska 6 120 23 Praha 2, Vinohrady, Czechoslovakia Telex : 122 486
	Standard frequency information: Ustav radiotechniky a elektroniky CSAV, Lumumbova 1, 182 51 Praha 8, Kobylisy, Czechoslovakia Telex : 122 646
PPE, PPR	Departemento Servico da hora Observatorio Nacional (CNPq) Rua General Bruce, 586 20921 Rio de Janeiro - RJ, Brasil
RBU, RCH, RID, RTA, RTZ, RWM, UNW3, UPD8, UQC3, USB2, UTR3	VNIIFTRI Mendeleevo Moscow Region 141570 Russia
TDF	Centre National d'Etudes des Telecommunications PAB - STC - Etalons de frequence et de temps 196 Avenue Henri Ravera - 92220 Bagneux, France
WWV, WWVH, WWVB	Time and Frequency Division, 576.00 National Institute of Standards and Technology 325 Broadway Boulder, Colorado 80303, U.S.A.
TVTO	Direccion de Hidrografia y Navegacion Observatori Cagigal Apartado Postal No 6745 Caracas, Venezuela
Y3S	See GDI

World-wide Satellite External Time Sources

To use satellites as an external time source, you must first ensure that the signals being transmitted are compatible with the protocol accepted by the Sysplex Timer. Sysplex Timer protocols are documented in ″Planning for the 9037″ document, GA23-0365.

Satellite Receivers

GPS Satellites: The NAVSTAR Global Positioning System (GPS), developed and deployed by the U.S. Department of Defense, is a very accurate radio navigation system. The 24 satellite constellation enables users, world-wide, to determine the correct time. Each satellite carries on-board atomic clocks which are tracked and maintained to UTC to better than ± 100 nanoseconds.

GOES Satellites: As a complement to the WWVB, NIST sponsors a satellite disseminated time code using the Geostationary Operational Environmental Satellites (GOES). The signal is continuously available to the entire Western Hemisphere.

Operated by the National Oceanic and Atmospheric Administration (NOAA), these satellites transmit a time code referenced to UTC which is generated by NIST atomic clocks.

Note

If you use a stable external time source such as those mentioned, the Sysplex Timer is capable of tracking to these providers to within 0.005 seconds.

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Jargon and Acronyms

A

ACTS. Automated Computer Time Service

APAR. Authorized Program Analysis Report

ASCII. American National Standard Code for Information Interchange (ASCII) is the standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity), used for information interchange among data processing systems, data communications equipment.

ASKQ. An application on HONE provided to IBM field personnel. ASKQ provides a electronic Question and Answer vehicle for technical questions.

B

BASIC MODE. A central processor mode that does not use logical partitioning. Contrast with logically partitioned (LPAR) mode.

BOC. Battery Operated Clock; as in the Processor Controller Element.

C

CE. Customer Engineer

CEC. Central Electronic Complex (see CPC)

CHANNEL. A path along which signals can be sent, for example, input/output channel.

CICS. Customer Information Control System

CPC. Central Processing Complex - The boundaries of a system, exclusive of I/O control units and devices, that can be controlled by a single operating system. A CPC consists of main storage, one or more central processor units, time-of-day clocks, and channels, which are or can be placed in a single configuration.

CPU. Central Processing Unit - The part of the computer that contains the sequencing of processing facilities for instruction execution, initial program load, and other machine operations.

CST. Central Standard Time.

D

DCE. Data Communications Equipment

DST. Daylight Savings Time

DTE. Data Terminal Equipment

E

EC. Engineering Change

ECA. Engineering Change Announcement

EIA. Electronics Industries Association

EREP. Environmental Error Record Editing and Printing Program

ESCON. Enterprise Systems Connection - A set of products and services that provides a dynamically connected environment using optical cables as a transmission medium.

EST. Eastern Standard Time.

ETR. External Time Reference. This is how MVS documentation refers to the 9037 Sysplex Timer. An ETR consists of 1 or 2 9037s and their associated console.

ETS. External Time Source. Sometimes MVS documentation refers to the 9037 Sysplex Timer as an ETS. The ETS may also be an accurate time source for setting the time in the Sysplex Timer (see ACTS).

F

FC. Feature Code - A code used by IBM to process hardware and software orders; as in Feature Code number 4040 (FC4040).

G

GMT. Greenwich Mean Time

GOES. Geostationary Operational Environmental Satellite

GPS. Global Positioning System

I

IMS. Information Management System

IOCP. Input/Output Configuration Program - A program that defines to a system all the available I/O devices and the channel paths.

IPL. Initial Program Load - The initialization procedure that causes an operating system to commence operation.

IRIG. Inter-range Instrumentation Group

J

JUMPER CABLE. In an ESCON environment, an optical cable having two conductors that provides physical attachment between two devices or between a device and a distribution panel. Contrast with Trunk Cable.

K

KM. Kilometers. To determine miles, divide kilometers by 1.61.

L

LED. Light Emitting Diode

LOC. Local Time

LPAR. Logical Partition - A subset of the processor hardware that is defined to support the operation of a system control program (SCP).

M

MES. Miscellaneous Equipment Specification. This is an IBM internal process for adding or removing feature codes from IBM hardware and software products.

MB. Mega-Byte - A unit of measure for storage size. One megabyte equals 1,048,576 bytes (loosely, one million bytes).

MODEM. Modulator/Demodulator - A device that converts digital data from a computer to an analog signal that can be transmitted on a telecommunication line, and converts the analog signal received to data for the computer.

MST. Mountain Standard Time.

MP. Multi-Processor - A processing complex that can be physically partitioned to form two operating processor complexes.

MVS. Multiple Virtual System - A generic term for whatever MVS release you might be talking about.

MVS/ESA. Multiple Virtual System/Enterprise Systems Architecture

N

NIST. National Institute of Standards & Technology

NOAA. National Oceanic and Atmospheric Administration

P

PCE. Processor Controller Element - Hardware that initializes and provides support and diagnostic functions for the processing unit.

PES. Parallel Enterprise Server (9672)

POR. Power-on-Reset - A function that re-initializes all the hardware in the system and loads the internal code that enables the machine to load and run an operating system. This function is sometimes intended as a recovery function.

PROTOCOL. A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. A specification for the formant and relative timing of information exchanged between communicating parties.

PR/SM. Processor Resource/Systems Manager - PS/SM enables logical partitioning of a processor complex.

PS/2. Personal System/2 (Personal Computer)

PST. Pacific Standard Time.

PTF. Program Temporary Fix

PTS. Parallel Transaction Server (9672)

R

RMF. Resource Measurement Facility

RPQ. Request for Price Quote. An RPQ is an process used by IBM to establish the availability of, and charge for, a non-standard machine, machine feature, program, or function. The term ″RPQ″ is sometimes used generically to describe various documents and procedures within the RPQ process. In its strictest definition, Request for Price Quotation describes the actual request initiated by the IBM branch office.

S

SCP. System Control Program - A computer program designed to schedule and to supervise the execution of programs of a computer system. Same as operating system.

SEC. System Engineering Change

SERVICE REPRESENTATIVE. A person who performs maintenance services for IBM hardware products or systems.

STA. Sysplex Timer Adapter (usually pertaining to the 9221 Sysplex Timer Attachment Feature).

STCK. Store Clock instruction

STR. Sysplex Timer (usually in connection with TPF)

SYSPLEX. System Complex - A collection of MVS/ESA systems that cooperate, using certain hardware and software products, to process workloads, while maintaining a single system image to the user.

T

TOD. Time of Day Clock - A system hardware feature that is incremented at least once every microsecond, and provides a consistent measure of elapsed time suitable for indicating date and time.

TPF. Transaction Processing Facility

TRUNK CABLE. In an ESCON environment, a cable consisting of multiple fiber pairs that do not directly attach to an active device. This cable usually exists between distribution panels and can be located within, or external to, an building. Contrast with Jumper Cable.

TSC. TOD Synchronization Compatibility (RPQ)

U

UTC. Universal Time Coordinated. Sometimes referred to as Universal Coordinated Time or Coordinated Universal Time.

V

VM. Virtual System

VM/ESA. Virtual System/Enterprise Systems Architecture

W

WTOR. Write To Operator with Reply

WWVB. NIST Radio Station

X

XCF. Cross-System Coupling Facility

XDF. Extended Distance Feature (ESCON Laser channel)

XES. Cross-System Extended Services

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Readers′ Comments

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