How To

ITER CODAC Glossary

The purpose of this glossary is to put together a number of key CODAC definitions in order to provide a consistent image of CODAC design and implementation and facilitate communication between the various parties involved.

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1 INTRODUCTION

1.1 Objective

ITER control system is being created by a large community spread over several continents and coming from different technical and cultural grounds. Having all the people speaking the same language and sharing the same understanding of core definitions is crucial to success of ITER. The purpose of this glossary is to put together a number of key CODAC definitions in order to provide a consistent image of ITER I&C design and implementation.

The approach to create glossary is explained in [RD1]. This edition does not yet fully follow these guidelines; the entries here should be considered as being in “in work” status. This snapshot records current understanding "as is" and provides the basis for further refinements.

The list of CODAC acronyms is maintained as a separate document [RD2].

1.2 References

[RD2] ITER CODAC Acronyms List (2LT73V v2.0), 16 Apr 2010
[RD3] Plant Control Design Handbook (27LH2V v5.2), 08 Feb 2010
[RD4] Plant Control Design Handbook for Nuclear control systems (2YNEFU v1.1), 01 Feb 2010
[RD5] CODAC term disambiguation (2EJCCF v2.0), 05 Dec 2008
[RD8] Requirements on Plant Systems and CODAC from Scheduling System (First version) (2MKGJU v1.0), 19 Aug 2009
[RD10] Definition of data format and list of parameters (First version) (2MGFRG v1.0), 19 Aug 2009
[RD11] CODAC software development environment (2NRS2K v1.0), 22 Jul 2009
[RD12] I&C signal processing, part I cubicle and wiring configurations (3299VT v3.1), 29 Jan 2010
2 DEFINITIONS

2.1 Definitions derived from the Plant Control Design Handbooks (PCDH and PCDH-N)

See the documents [RD3] and [RD4].

[GL1] **Alarm** – a condition signalled by a plant system as having a possibility to prevent it from satisfying the operating requirements.

[GL2] **Autonomous** – the ability to fulfil the system’s own objective without being dependent on other interfacing systems (does not necessarily mean that no human is involved).

[GL3] **Commissioning** – a process of putting the plant system into service by means of adjustment of the system elements to enable them to operate safely and efficiently.

[GL4] **Cubicle** – a duly protected cabinet housing I&C hardware components as well as power supply and air ventilation facilities.

[GL5] **Inspection** – verification that all instruments, equipment and cabling have been installed in accordance with the design documentation and that the installation conforms to I&C standards.

[GL6] **Instrument** – a device used for detecting, measuring or analyzing parameters of the process or equipment.

[GL7] **Instrumentation and Control** – synthesis of hardware and software applied as necessary to a technical process in order to attain the process’ objective.

[GL8] **Interlock** – one or a combination of preventive and protective actions for investment protection.

[GL9] **Investment Protection** – protection of a system from material damage which would result in significant cost or schedule implications.

[GL10] **Operational Limits and Conditions** – a set of rules setting forth parameter limits, the functional capability and the performance levels of equipment and personnel approved by the regulatory body for safe operation of an authorized facility.

[GL11] **Plant System** – an autonomous part of the ITER Plant implementing and responsible for a given technical function.

[GL12] **Safety** – a condition of being protected from nuclear, non-nuclear (conventional) hazards and hazards to personnel.

[GL13] **Trip** – an automatic protective action against excursion beyond the defined limits.

[GL14] **Event** – a condition signalled by plant systems as a result of plant system of plasma behaviour change with or without prediction.


[GL16] **Central I&C Systems** – all hardware and software required to coordinate and orchestrate all plant systems I&C, including plant wide investment protection and safety functions and to provide the human machine interface (HMI). It comprises the CODAC System, Central Interlock System and Central Safety Systems.
Plant System I&C – all hardware and software required to control a plant system including local investment protection and safety functions. Comprises Plant Control System, Plant Interlock System and Plant Safety Systems.

CODAC System – provides overall plant systems coordination, supervision, plant status monitoring, alarm handling, data archiving, plant visualization (HMI) and remote experiment functions. Communicates with plant control systems using CODAC networks.


I&C Networks – provide physical interface between Central I&C Systems and plant systems I&C. Comprise CODAC Networks, Central Interlock Network and Central Safety Networks.

CODAC Networks – a set of networks providing the physical and logical interconnection between CODAC System and plant systems I&C. The functions of different CODAC networks include distribution of commands and data exchanges, time and events, plus a means of fast synchronous communication.

Central Interlock Network – provides a physical interface between Central Interlock System and Plant Interlock System.

Central Safety Networks – provide physical interfaces between Central Safety Systems and Plant Safety Systems.

Nuclear Central Safety Networks (CSN-N) – provide physical interfaces between Nuclear Central Safety Systems and Nuclear Plant Safety Systems.

Conventional Central Safety Networks (CSN-C) – provide physical interfaces between Conventional Central Safety Systems and Conventional Plant Safety Systems.

Access Control Central Safety Networks (CSN-AC) – provide physical interfaces between Central Safety Systems and Plant Safety Systems.

Plant Control System – provides local data acquisition, control, monitoring, alarm handling, logging, event handling and data communication functions. Communicates with CODAC System using CODAC Networks. Comprises plant system host, plant system controller(s) and signal interface(s).

Plant System Host (PSH) – provides asynchronous communication from CODAC System to Plant Control System and vice versa. Provides command dispatching, state monitoring, data flow and configuration functions.
[GL33] **Plant System Controller** – provides plant system specific data acquisition, control, monitoring, alarm handling, logging and event handling functions.


[GL35] **Plant Interlock System Controller** – provides event detection, monitoring and logic for investment protection functions.


[GL40] **Plant Safety System Controller** – provides events detection, monitoring and logic for safety functions.

[GL41] **Nuclear Plant Safety System Controller** – provides event detection, monitoring and logic for functions important for nuclear safety.

[GL42] **Conventional Plant Safety System Controller** – provides events detection, monitoring and logic for safety functions.

[GL43] **Access Control Plant Safety System Controller** – provides events detection, monitoring and logic for access control safety functions.

[GL44] **Safety Control System for Nuclear safety related systems (SCS-N)** – all hardware and software required to provide plant-wide nuclear safety functions. It encompasses CSS-N, CSN-N and all the PSS-N.

[GL45] **Plant System Responsible Officer** – provides input throughout the design process. He/she reviews the plant system I&C design as well as approves PS factory acceptance test and site acceptance test.

[GL46] **Plant System Central I&C Responsible Officer** – develops, supports, maintains and enforces I&C development standards, development process and design conventions. He/she also provides PSH hardware and software to plant system I&C suppliers. He/she reviews the plant system I&C design and participates in factory acceptance tests and site acceptance tests.

[GL47] **Plant System I&C Designer** – designs the plant system I&C according to I&C specifications.

[GL48] **Plant System I&C Supplier** – supplies any I&C equipment or component including spare units. The boundary of the supply is defined in the PA. Configuration of the PSH and Mini-CODAC – used as a local CODAC system – is a task of the plant system I&C supplier.

[GL49] **Plant System I&C Integrator** – integrates the plant system I&C in ITER Central I&C Systems. He/she is in charge of the I&C part of the plant system integrated commissioning.
[GL50] **Plant System I&C Operator** – operates the plant system I&C. He/she works mainly in the MCR and uses control and monitoring tools delivered by the plant system I&C supplier. He/she has received the necessary training based on information provided by the plant system I&C supplier.

[GL51] **Plant System I&C Maintenance Operator** – maintains the plant system I&C. He/she conducts preventive and routine maintenance as well as unplanned maintenance in case of breakdown. He/she manages spare units.

[GL52] **I&C Naming Conventions** – a convention for uniquely identifying parts and components for the ITER I&C System.

[GL53] **Self Description Data (SDD)** – plant system self description data (SDD) is static configuration data which describes the plant system characteristics in a unified way in order to facilitate configuration of the central I&C systems software for operation with the given plant system.

[GL54] **Global Operating States (GOS)** – GOS represent overall ITER plant system operating states defined by plant wide operational activities associated with permission or prohibition of the plant operational activities.

[GL55] **Common Operating States (COS)** – COS is a state property that implements simple and synthetic state information common to all the plant systems so that they can be managed in a coherent way by CODAC system.

[GL56] **Plant System Operating States** – plant system operating states are specific to individual plant system I&C. The plant system operating state is a mandatory state property that implements detailed and plant specific state information. Each value of the plant system operating state maps to one and only one value of the COS.

[GL57] **Control mode** – control mode is a property that indicates whether or not the plant system is under (normal) Central Control via CODAC System from MCR or under Local Control using other interfaces.

[GL58] **Central Control** – central control refers to the normal state in which the CODAC system is monitoring and supervising all the plant systems.

[GL59] **Local control** – local control refers to control outside the MCR by using mini-CODAC or manual control of the plant system equipment.

[GL60] **Mini-CODAC Control** – mini-CODAC control will be used during FAT, SAT and local control.

[GL61] **Manual Control** – manual control refers to the ability of personnel local to the plant system to control equipment of the plant system independently from the plant system I&C during maintenance of the equipment (e.g., using front panels).

[GL62] **Plant System Slow Controller** – controller refers to the PLC performance.

[GL63] **Plant System Fast Controller** – controller refers to the units which are faster than PLC performance (10 ms).

[GL64] **Network Hutch** – a network hutch is a closed area equipped with heating, ventilation and air conditioning and adequate uninterruptible power housing a set of cubicles, which accommodate the active and passive components for plant system I&C networks.

[GL65] **Network Panel** – a network panel is the physical termination point for I&C networks. Network panels are installed at strategic locations in network hutches and wall mounted boxes close to plant system I&C cubicles.

[GL66] **Plant Operation Network (PON)** – a general-purpose data communication network used to interconnect Plan System Hosts, Plant System Controllers and CODAC.
Synchronous Databus Network (SDN) – a synchronous real-time network used to interconnect Plant Systems I&C and CODAC in order to organize deterministic plasma feedback loops with sampling frequencies in the kHz range.

Time Communication Network (TCN) – a specialized communication network to provide project wide time synchronization signals from CODAC to plant systems I&C with required accuracy and jitter.

Audio Video Network (AVN) – a network used for communication of audio and video signals between plant systems I&C and CODAC. Video signals may be for surveillance purposes (lossy transmission) or for scientific purposes (lossless transmission).

High Performance Networks (HPN) – dedicated networks having guaranteed performance for data exchange between CODAC and plant systems I&C. They include SDN, TCN and AVN.

Rule – refers to a statement that is a mandatory I&C requirement for the plant system I&C life cycle process.

Guideline – recommendation for plant systems I&C lifecycle process.

2.2 Definitions derived from the CODAC term disambiguation document

See the document [RD5].

CODAC – the same as CODAC System.

CODAC Collaboration – community built around CODAC Group to enhance and promote CODAC solutions.

CODAC Group – CODAC personnel plus their associates (DAs specialists, IO and DAs subcontractors) developing and supporting CODAC System.

CODAC Personnel – IO staff developing and supporting CODAC System.

CODAC PMWG – advisory board to CODAC personnel headed by IO representative and consisting of appointed DA specialists and (optionally) additional experts.

CODAC Subsystem – system within CODAC system implementing specific CODAC system functionality.

CODAC Team – the same as CODAC personnel (less formal).

Core CODAC – Internal CODAC components intended for overall Plant Systems orchestration and exploitation and developed under responsibility of IO. Includes Central Interlock and Central Safety Systems. Covers both software and hardware.

Mini-CODAC – simplified version of Central I&C Systems intended for Plant Systems I&C development, testing, and acceptance.

Open CODAC – part of CODAC System located or accessible outside POZ.
2.3 Definitions derived from the I&C Primer and Plant System Architecture documents

See the documents [RD6] and [RD7].

[GL83] **Conventional Control System** – a tier that is responsible for the overall safe operation of ITER.

[GL84] **Interlock Control System** – a tier that is dedicated to the protection of investment (machine protection) in the case where conventional control systems are inadequate for the reduction of a risk and/or it is not efficient to increase their risk reduction capabilities;

[GL85] **Safety Control System** – a tier that aims at providing protection of personnel and environment.

[GL86] **Plant System Layer** – the plant systems I&C provides the functionality required for its own safe operation. This includes the plant control system for the control of all the processes.

[GL87] **Central System Layer** – the CODAC System which provides the functionality required for integrated and distributed Control, Data Access and Communication system for operating the ITER facility.

[GL88] **Local Data** – data flowing from the sensors/actuators to the plant systems’ controllers and vice-versa.

[GL89] **Global Data** – data flowing from the plant systems to the Central I&C Systems and vice-versa.

[GL90] **Signal/Data Acquisition** – plant systems acquire data from their respective sensors, after conditioning of signals to their prescribed characteristics (sampling rate, precision, accuracy, etc.) and according to configuration parameters monitored in the MCR and stored in a central database.

[GL91] **Local Processing** – data acquired is used by the plant system controllers in the performance of their tasks (data processing, process control, interlock function, etc.).

[GL92] **Signal/Data Output** – output of the plant system controllers may involve the use of actuators within the same plant system (direct link), the use of actuators that belong to another plant system.
(indirect link) or the transmission of the processed data to the central monitoring and archiving system. Indirect links are implemented via the central I&C systems.

[GL93] **Intercommunication** – communication between plant systems and between plant systems and central I&C systems is done via the I&C networks. These I&C networks must be seen as data buses rather than simple communication networks.

[GL94] **Global data flows** – all processed local data is transmitted to the central I&C systems (no hidden data). In some cases, raw data may also be transmitted to the central I&C systems for diagnostic purposes. Processed global data may be sent to the plant systems.

[GL95] **Global data processing** – global data is processed by the central I&C systems for the performance of their tasks (data analysis, central process control, central feedback control, central interlock functions, central safety functions, etc.).

[GL96] **Global data monitoring** – global data can be monitored in real-time via synoptic panels (Human Machine Interfaces - HMI). This also includes the parameterization and visualization of alarms, events and real-time analysis tools. A dedicated safety desk allows monitoring of the safety systems.

[GL97] **Global data archiving** – after processing, global data is stored in the archives, classified according to specific parameterized characteristics (filtering, decimation, sensitive nuclear or personal data, etc.)

[GL98] **Global data access** – all data stored in the archives can be accessed both on-site and remotely with specifically designed tools and methods.

[GL99] **Global operation tools** – operation of ITER as a whole is carried out using a set of tools that allow operation and control of CODAC system and plant systems.

[GL100] **COTS intelligent device** – is a commercial off-the-shelf device (i.e. controller), which implements integrated control functions.

[GL101] **OSI layer 2 switch** – is a standard Ethernet switch, which allows full management of the I&C Networks.

[GL102] **CODAC Servers** – computers running RHEL (Red Hat Enterprise Linux) and ITER wide coordination application software (such as overall supervision, monitoring, scheduling, data handling and data archiving) for the coordination of the ITER subsystem.

[GL103] **CODAC Terminals** – display units and input devices to allow operators to interact with ITER, its subsystems and plant systems I&C.

[GL104] **CODAC High Performance Computers (HPC)** – dedicated computers to execute plasma control algorithms.

[GL105] **Safety Desk** – a dedicated human interface to the Central Safety System which is completely independent of the rest of the system.

[GL106] **Continuous Systems** – are sensing and acquiring data, monitoring, processing and outputting data for controlling the process.

[GL107] **Pulsed Systems** – system working in a pulsing mode, i.e., concentrating the majority of their work and performance shortly before, during, or after the pulse.

### 2.4 Definitions derived from the Scheduling Task documents

See the documents [RD8], [RD9] and [RD10].
**Actor** (in the context of object oriented design and analysis) – user or system agent that initiates use case of the system.

**Algorithm** – a procedure or a method for solving a problem. In this context, an effective method for controlling a plasma.

**Algorithm ID** – identification code to identify a control algorithm that is implemented in the Plasma Control System.

**Bridge segment** – a segment that is designed to join segments together.

**Class** (in the context of object oriented design and analysis) – the prototype for an object in an object oriented language; analogues to a derived type in a procedural language. A class may also be considered to be a set of objects which share a common structure and behaviour. The structure of a class is determined by the class variables which represent the state of an object of that class and the behaviour is given by a set of methods associated with the class.

**Class diagram** (in the context of object oriented design and analysis) – a UML diagram that shows a collection of declarative (static) UML model elements such as classes and types, with their contents and relationships.

**Configuration property** – a configuration property can be either a static configuration property that cannot be changed during operation via access commands or operational settings that can be modified during operation via CODAC.

**Execute (command)** – command to run a specified instruction or software program.

**Execute (pulse schedule)** – orchestrate plant systems for plasma operation based on a pulse schedule.

**Instance** (in the context of object oriented design and analysis) – an individual object of a certain class. While a class is just the type definition, an actual usage of a class is called "instance". Each instance of a class can have different values for its instance variables, i.e. its state.

**Object** (in the context of object oriented design and analysis) – in object oriented programming, an instance of the data structure and behaviour defined by the object's class. Each object has its own values for the instance variables of its class and can respond to the methods defined by its class.

**Off normal event** – off normal events are occurrences that could harm the ITER device.

**OMG (Object Management Group)** – a consortium aimed at setting standards in object oriented programming.

**Operation Request Gatekeeper (ORG)** – a rule based software in CODAC which allows data entry into the Plant Operation Zone.

**Plant Operation Zone (POZ)** – a self-contained operation area that is separated logically and physically from the rest of the ITER site. Main ITER devices are placed and actual operations are conducted in this area.

**Plasma operation scenario** – specific parameters that determine plasma operation criteria such as plasma current, toroidal field, discharge time, and plasma shape.

**Pulse** – an operational unit of ITER that designates plasma operations, a pre discharge sequence and a post discharge sequence.

**Pulse schedule** – a set of parameters that determine a pulse. Pulse schedules are specified before a pulse.

**Pulse sequence** – a time contiguous set of scheduling blocks in the same pulse schedule.
Reference waveform – a waveform of expected values.

Rescheduling – replacement of several segments of a pulse schedule during a pulse.

Segment – a portion of a pulse, having parameters that are used for plasma control. Plasma control algorithms are implemented in the PCS.

Set point – desired process values in the (PID) control. In the case of the plasma control, set points could be represented by a waveform.

Shift – a period of work and/or operations. The ITER device will be operated in three shifts in a day.

UML (Unified Modelling Language) – OMG standard language for analysis and design of applications, specifying the structure and behaviour of systems. UML is defined as an underlying abstract syntax and an overlying graphical concrete representation.

Use Case – a specific way of using the system by performing some part of the functionality.

Use Case (in the context of object oriented design and analysis) – abstracted functions and requirements of a system.

User – a person authorised to use the control system. There will be different classes of users with different levels of privilege.

Exception – an exception is an occurrence that could harm the ITER device. Similar to off normal event.

Exception handling – executing a control algorithm that controls an exception safely and appropriately.

Module – a minimum unit of plasma control. It is equivalent to an algorithm that is implemented in the PCS.

2.5 Definitions derived from the Software Development Environment document

See the document [RD11].

Developer – a person actively contributing to the source code i.e. a person who works with the framework and is responsible for some part of the customisation of the control system.

Development manager – a person defining release policy on a feature/bugs code level and supervising developers.

Documenter – a person writing end user documentation.

Module (software) – a piece of software possessing a well-defined function(s).

Packager – a person performing packaging of the releases, but not contributing to the code except for packaging specific changes.

Release manager – a supervisor of the development activity, responsible for overall product release.

Repository admin – a person maintaining the Subversion (SVN) repository.

Server admin – a person having administrator privileges on relevant development machines and installing system wide software on demand.
2.6 Definitions derived from the PS I&C Signal Processing document

See the document [RD12).

[GL154] **I&C cubicle** – is a local control cubicle, a signal conditioning cubicle or a combination of both.

[GL155] **I&C earth** – an I&C earth is defined for each I&C cubicle. The I&C earth is unique for each cubicle and is connected to the ISEG (ITER Site Earth Grid) by the shortest way and suitable cable. I&C earth is distributed within the I&C cubicle by the I&C earth bar.

[GL156] **I&C equipment** – is any hardware device housed in I&C cubicles.

[GL157] **Local Control Cubicles (LCC)** – LCCs house the plant system I&C controllers. An LCC may house signal conditioning to improve integration of I&C equipment.

[GL158] **Plant system equipment (PSE)** – plant system equipment is any plant system device which is controlled or monitored by the plant system I&C. It may be from a single sensor/actuator up to a fully integrated set of components including embedded interfaces for powering, local controls, safety and interlocks e.g. a compressor or a power supply with associated auxiliaries as provided by the equipment supplier. Plant system equipment may have local panels for manual control or local monitoring, but no dedicated SCADA system.

[GL159] **Remote I/O** – a remote I/O is an I&C controller rack dedicated to an I/O interface only. The I/O rack is connected to the central CPU rack through a fast multiplexed link. It refers to the group of IO process signals onto one digital communication link to the controller.

[GL160] **Signal Conditioning Cubicles (SCC)** – SCC house the I/O interfaces dedicated to signal conditioning. An SCC may include remote I/O, but there is no intelligence for controls in SCC.

[GL161] **Signal Junction Cabinet (SJC)** – is a box or cabinet dedicated to I&C signal cable interfaces between PSEs and the plant system I&C cubicles.

2.7 Definitions derived from the HPN Technical Note

This document was not yet officially released.

[GL162] **Clock** – a source of regularly occurring pulses used to measure the passage of time.
Control Cycle Time – control loop cycle time or the control loop latency is defined as the time for data to be acquired, the necessary calculations to be performed and to output the command control to the actuator.

GPS (Global Positioning System) – a system of satellites that broadcast accurate time signals.

Hard Real-Time Systems – Hard RT systems impose limits on response times, so that a delayed result is a wrong result.

IEEE 1588 – the IEEE specification that describes a synchronization protocol for clocks of multiple devices connected via a network.

Jitter – is a variation in measured time value.

Node – The endpoint of a network branch or the junction of two or more branches. A node can be either in a plant system or the CODAC system and can receive and send information from/to network.

NTP (Network Time Protocol) – a protocol that synchronizes the clock of computers connected via an Ethernet network.

Oscillator – a device that generates a fixed frequency signal (clock).

Plasma Control System (PCS) – a hardware and software system used to perform real-time control functions of fusion plasmas.

Precision – a measure of the deviation of the time or frequency error between the clocks under test.

Propagation Delay – the amount of time required for a signal to pass through a circuit or network or system.

PTP (Precision Time Protocol) – the IEEE 1588-defined network protocol used to synchronize the clocks of multiple devices connected via a network.

Soft Real-Time Systems – soft real-time systems only need to meet a time-average performance target. As long as most of the results are available before the deadline, the system will run successfully, with acceptably recognizable output.

Stability – a measure of how the mean of the time or frequency error between the clock under test and a perfect reference clock varies with respect to variables such as time, temperature.

Synchronization – The process of maintaining one operation in step or time with another. Data sampling is synchronized to a master clock that is distributed on the networks and whose precision depends on the plant systems’ own requirement.

UTC (Coordinated Universal Time) – the time system that accounts for leap seconds and is employed by many network standards, including NTP.

2.8 Definitions derived from the CODAC-PS Interface document

See the document [RD13].

OPSTATE – is a state property that implements a simple and synthetic piece of information applicable to each plant system.

OPREQ – is a configuration property that implements a simple command applicable to each plant system.
Configuration – represents the set of internal values that is the input for the plant system's I&C processing and that can only be modified by means of commands or changes in the self-description.

State – represents the set of internal values that reflect the current state of the system as maintained by the plant system's I&C processing, according to the configuration and the input signals. A characterisation of a system or subsystem at a given time.

Discrete property – can only have a defined set of values. Its definition includes the specification of each value, consisting in a numeric code and an alphanumerical label. This applies to Boolean values and to enumerations.

Continuous property – has a continuous range of values that may be bound by limits. Its definition includes the data type, the units and may include limits for operation and alarms.

2.9 Definitions derived from other CODAC and plant systems documents

Source of these definitions is TBD.

Action – a control operation that is performed by the operator or by the control system.

Action item – activity to be performed or question to be resolved by the responsible officer/nominated person.

Actuator – an electro-mechanical device for performing control functions of the plant system/subsystem.

Alarm Condition – an alarm condition is an expression that is evaluated by the Control System and if found to be true causes an Alarm to be generated.

Analog Signal – an electrical signal that may have continuously varying voltages/currents, frequencies, or phases.

Architecture – the description of a system in terms of a number of well-defined components, hardware and software, and their interactions. Each component provides well defined functionality and the interactions between them are described in terms of a series of interfaces.

Asynchronous – a term that describes a non-clocked or free-running digital signal that triggers operation.

Asynchronous Event or Random Event – an event that occurs at an arbitrary time, without synchronization to a reference clock. Occurrence of an event is not pre-defined.

Attribute – configurable data associated with a device property. Attributes are writable and readable.

Backplane – a part of an embedded system into which the system's boards are plugged to provide a common voltage supply, reference, and SYSTEM BUS.

Backup Control Room (BCR) – control room equipped with the limited necessary functionality for use when the Main Control Room is not available.

Bandwidth – the measure of a device's or system's ability to pass a full amplitude signal over a range of signal frequencies.

Black Box – a term that refers to an electronic circuit or system within an enclosure without necessarily providing details of its internal elements. The black box concept often offers a useful approach in the design of a system or in the interconnect between two circuits or systems.

System Bus – a series of transmission lines connecting the various elements of an embedded system/computer for distribution of data, control signals, addresses, and/or voltage supply(s) within an embedded system/computer.

Byte – a group of 8 binary bits is called a byte.
Command – a command is defined to be a message, which can change the state or operation of a device / system or group of devices / systems.

Component – a physical and replaceable part of a system which provides well defined functionality and which supports one or more Interfaces.

Computing device – a device or function that performs one or more calculations or logic operations, or both and transmits one or more resultant output signals.

Configuration Database – the database containing all the information required to configure the systems.

Configuration Management – the process of identifying, defining, recording and reporting the configuration items in a system and the change requests for that system.

Configuration Parameter – a part of the specification of the configuration of a device / system, e.g., Alarm limit, Set Point, scan frequency, etc.

Console – the term referring to a combination of a display and keyboard interfaced to a system.

Contract – an all-inclusive term used to cover Procurement Arrangements, Task Agreements and Contracts placed directly by the IO.

Control point – the smallest atomic quantity used when setting a hardware value. Control points are writable and readable.

Controller – a device having an output that varies to regulate a controlled variable in a specified manner.

DAC (Digital-to-Analog Converter) – an electronic device that converts a digital number into a corresponding analog voltage or current.

Data Acquisition System – the system used to acquire the physics information and to build event data sets.

Data Archiving – archiving is long term storage of information.

Data Driven Application – is one where data is fed into an application either as the data is collected or from a data archive.

Data Logging – refers to collecting and storing all the data from all the Plant Systems at a minimum rate.

Data Monitoring – refers to making the logging data available to applications.

Data Storage – storage refers to the coordinated permanent storage of the data.

Data stream – a sequence of digitally encoded signals used to represent information to be transmitted. The data streams are continuous data flows between plant systems and CODAC.

Data Visualization – visualisation refers to providing the data being monitored on screens, and allowing operators to modify the data to be sent to the Plant Systems I&C.

Database – a collection of information organised in such a way that a software program can quickly select desired pieces of data.

Database Management System (DBMS) – a collection of procedures or programs that enable a user to enter, organise, and select data in a database.

Derived Parameter – calculated by the control system from a combination of measured or other derived parameters.

Design Approver – the person who has the responsibility to approve the design of the system in the ITER Organization.

Deviation – a planned alternative to a specified requirement.

Device – in a computer system, this term refers to a unit of processing equipment external to the CPU.

Device type – an abstract description of the capabilities and behaviour of a physical or logical device.
Diagnostic – a system used for measuring one or more plasma quantities (temperature, density, current, etc.).

Display – a peripheral device serving as a computer readout, such as a cathode-ray tube (CRT), flat-panel, or other readout devices.

Documentation – information that explains systems hardware or software. It is usually provided as a manual or files stored on a disk.

Domestic Agency – an organization set up under the ITER Framework Agreement to provide goods or services to the ITER Organization through Procurement Arrangements (PA) and Task Agreements (TA).

Engineering data – correspond to a set of parameters with their values as a function of time. These parameters serve mainly to control and monitor the ITER machine.

EPICS (Experimental Physics and Industrial Control System) – the EPICS is a set of software tools and applications which provide a software infrastructure framework for use in building distributed control systems to operate devices.

Epoch – the reference time defining the origin of a time scale.

Error – an act, assertion, exception or belief that unintentionally deviates from what is correct, right, or true.

European Union – the European Union (EU) is a union of many independent states based on the European Communities and founded to enhance political, economic and social co-operation. Formerly known as European Community (EC) or European Economic Community (EEC).

Events-based trigger – is an event within the system, including the creation or deletion of objects or relationships, the starting or stopping of an activity.

Exception – an exception is a deviation from an expected state and can be seen as an event that requires some recovery action.

Expert – a user of the system who has detailed knowledge of a particular system/subsystem.

Failsafe – describes a device or feature which, in the event of failure, responds in a way that will cause no harm, or at least a minimum of harm, to other devices or danger to personnel.

Fan In – the maximum number of output terminals from other systems or logic gates that can be connected to an input terminal of a specified system or logic gate.

Fan Out – the maximum number of input terminals that can be connected to the output terminal of a specified system or logic gate.

Fast Control – performance requirements for fast controls is higher than PLC performance i.e. on the order of 1 msec or higher.

FAT (Factory Acceptance Test) – is a major project milestone where the PA Supplier demonstrates that the system design and manufacturing meets the contract or PA specifications.

Fatal Alarm – a Fatal Alarm is defined to be an alarm condition which requires an immediate intervention.

Fault – refers to the defect or failing functionality of system.

Fault Alarm – a Fault Alarm is defined to be an alarm level which indicates an undesired condition of one or more devices.

Fault Recovery – a sequence of actions that are applied to restore the correct operation of the process of the system following an error condition.

Fibre Optic Cable – a transmission medium that uses glass or plastic fibre that carries light along its length.

Fibre Optic Connector – a quick connect/disconnect assembly to interconnect: a light source to a fibre optic cable; a fibre optic cable to another fibre optic cable; a fibre optic cable to a light detector.

Fibre Optic Coupler – a mechanical component that interconnects a number of fibre optic cables in a bidirectional system by mixing and splitting all light signals within the cable.
[GL244] **Fibre Optics** – the technology of transmitting and guiding optical radiation (light) along optical conductors.

[GL245] **Field Bus** – a Field Bus is a data transport medium typically used in the domain of process control for connecting field devices to PLCs or SCADA systems.

[GL246] **Finite State Machine (FSM)** – is an algorithm which can, on an event, change the state of a system by making transitions.

[GL247] **Firmware** – a combination of a software program in hardware, such as a read-only memory (ROM), or a disk that has files or software programs written for hardware.

[GL248] **Floating** – a condition where a common mode voltage exists, or may exist between earth ground and the system or instrument or circuit of interest.

[GL249] **Flow Chart** – a symbolic representation of the processing steps performed by a software program or a graphic sequence of logic operations implemented in hardware.

[GL250] **Format** – an orderly, structured arrangement of data elements (bits, bytes, and/or fields) that is necessary to produce a larger entity, such as: a list, record, table, file, or dictionary. A specification for the consistent structuring of data of a specified type.

[GL251] **Framework** – a framework is an integrated set of tools which are used by developers of the control system to develop their part of the control system application.

[GL252] **Frequency** – the number of cycles per second of an AC wave measured in Hertz (Hz).

[GL253] **Frequency Range** – the measure of a system or circuit's ability to pass a full amplitude signal over a range of signal frequencies.

[GL254] **Full Duplex** – a data transmission mode that provides simultaneous and independent transmission and reception.

[GL255] **Function** – a defined objective or characteristic action of a system or component. The purpose of or an action performed by a device.

[GL256] **Functional requirement** – a requirement that specifies a function that a system or component must be able to perform.

[GL257] **Functional specification** – a document that specifies the functions that a system or component must perform.

[GL258] **Gbps** – gigabits per second (billions of bits per second). A measure of digital data transmission rate.

[GL259] **GPI** – Generic Plant Interface, between CODAC and PSH. It defines concepts commands, command responses, data, alarms, and some generic commands to be implemented by all plant systems.

[GL260] **Grandmaster clock** – within a domain, a clock that is the ultimate source of standard reference time for clock synchronization using the protocol.

[GL261] **Ground** – the part of a circuit or equipment or system that is the reference for the voltages existing in that circuit or system.

[GL262] **Guidance document** – a document that describes a particular procedure or process but that does not include any requirements.

[GL263] **Half Duplex** – a communications mode that allows transmission and reception of digital data between systems / computers, but not simultaneously.

[GL264] **Handshaking** – a communications synchronizing technique carried out before and after any transfer of digital data. It consists of a sequence of signals for non-clocked (asynchronous) systems in which a reply is needed to complete a data transfer operation.

[GL265] **Hardware** – the physical equipment of a computer system consisting of mechanical and electrical/electronic components.

[GL266] **HMI** – computer screen including graphics based visualization of plant control and monitoring system.
**Hot swapping** – refers to the changing components or replacing system components without shutting down the system and without significant interruption to the system.

**I&C component** – refers to a constituent element of an I&C system.

**I&C configuration** – refers to the setting of equipment parameters.

**I&C Interface** – an interface boundary across which CODAC and plant systems meet and act on or communicate with each other.

**I&C Lifecycle** – the successive stages through which plant system I&C passes from an initial feasibility study through maintenance of the completed plant system.

**I&C review process** – refers to I&C documents evaluated for technical quality and correctness by other experts in the same field.

**ICD (Interface Control Document)** – a document specifying a software or hardware interface between systems.

**Identification** – the sequence of letters or digits, or both, used to designate an individual instrument or device.

**IP Address** – an Internet Protocol (IP) address is a numerical identification and logical address that is assigned to devices participating in a network.

**Instrumentation** – a collection of instruments or their application for the purpose of observation, measurement, control, or any combination of these.

**Intellectual Property** – property that results from original creative thought such as patents, copyright materials, and trademarks.

**Interrupt** – the suspension of normal program execution to perform a higher priority service routine as requested by a peripheral device. After completion of the service routine operation, the interrupted program routine is resumed at the point where it was interrupted.

**IO** – ITER Organization referred to as ITER.

**IPT (Integrated Product Team)** – the designation given to each of the groups responsible for the design and construction of major ITER systems.

**Kernel** – the kernel of an OS (RTOS-Real Time Operating System) is the part that schedules which thread gets to execute at a given point in time.

**Keyboard** – a peripheral device consisting of alphanumeric, punctuation marks, and other special function keys that are mechanically arranged to allow the entry of data, commands, and other information into the system.

**LAN (Local Area Network)** – usually referring to the network connecting workstations and desktop systems within a single building or institution.

**Library (software)** – a collection of standard software instructions, programs, routines, and subroutines in a computer's memory.

**LCD (Liquid Crystal Display)** – a display having conductive segments or dots deposited on the inside surfaces of two transparent glass plates separated by a crystal in liquid form. When energized with AC voltage in the presence of light, the selected segments will provide black-tone or gray readout.

**List** – a list is a set in which the elements have a defined order.

**Local Control Panel** – refers to the physical control panel or the software equivalent that provides options for the user or operator to operate and control the plant system.

**Log** – a chronological store for information such as alarms, user actions and process data.

**Main Control Room (MCR)** – command centre from where ITER plant operation and control functions are executed by plant operators.

**Maintenance** – the routine recurring work required to keep a PS I&C in such condition that it may be continuously utilized, at its original or designed capacity and efficiency, for its intended purpose.

**Master** – the requesting or controlling device in a master/slave configuration.
Master clock – a primary source of time to which all other clocks on that path synchronize.

Master/slave – a model for a communication protocol in which one device or process (known as the master) controls one or more other devices or processes (known as slaves). Once the master/slave relationship is established, the direction of control is always from the master to the slave(s).

Mbps – megabits per second (millions of bits per second). A measure of digital data transmission rate.

Measured Parameter – a measured parameter is an individual piece of information, which is read by the control system from a device.

Measurement – the determination of the existence or the magnitude of a variable.

Memory – a data storage structure in a computer that accepts binary information for storage in electrical, mechanical, or magnetic form, and retains the information for as long as needed.

Message timestamp point – a timestamp is defined by the instant a message timestamp point passes the reference plane of a clock.

Method – the name given in object oriented programming to a procedure or routine associated with class. It is the implementation of an operation.

Mode – a condition in which a system, subsystem, or component may exist. Normally it comprises a set of possible states.

Model – a model is an abstract computational or mathematical representation of the structure and functioning of a system or some aspect of it.

Monitor – the visual readout device of a computer system. A monitor can be in several forms: a cathode ray tube (CRT), a liquid crystal display (LCD), or a flat-panel, full-colour display.

Monitor point – the smallest atomic quantity read from hardware. Monitor points are always read only.

MTBF – an abbreviation of Mean Time Between Failure, a theoretical period of time between failures in equipment based on stresses in environment, temperature, levels of quality and other parameters.

MTTR – an abbreviation for Mean Time To Repair, a theoretical period of time need to repair a piece of equipment given certain circumstances.

Multicast communication – in this style of communication any node may post a message and all nodes in the same segment of a sub domain will receive this message.

Multitasking – the technique of using several applications programs (tasks) in a computer system or on several terminals in a network at the same time. Multitasking can simultaneously work with several programs or interrelated tasks that share memories, codes, buffers, and files.

NIC (Network Interface Card) – a device that connects a computer system to a communication network.

Noise – any unwanted electronic signal accompanying the desired signal.

Noise Figure – an expression of noise generated within a device/system, representing quality of the system, specified in dB.

Non-conformance – any condition, which does not comply with a specified I&C requirement.

Non-conformance register – a duly managed list of non-conformances.

Operating System (OS) – a structured software program (set of programmed routines) that manages, controls, coordinates, and sequences the hardware and software resources of a computer system.

Operational – a device is said to be operational if it is ready to or is already performing its function.

Operational mode – the mode of a system, subsystem, or component that is installed in its intended environment.
Operational state – a state of a system, subsystem, or component that is installed in its intended environment.

Operator – a user of the control system who is responsible for the overall operation of the experiment.

Package – a major subdivision of a software project in which a set of associated functions that are designed, developed, and tested together and independently from other packages are combined.

Panel – a structure that has a group of instruments mounted on it, houses the operator-process interface, and is chosen to have a unique designation. The panel may consist of one or more sections, cubicles, consoles, or desks.

Panel-mounted – a term applied to an instrument that is mounted on a panel or console and is accessible for an operator's normal use.

Parameter – a parameter is any variable whose value may be modified. There are several types of parameter and these are configuration, derived, measured, output and user input parameters.

Part (spare part) – an element of plant system such as valve, instrument, fittings or connecting elements such as pipes, circuits, cables, cable trays, liners and insulation.

Period – the time required to complete one cycle of AC and is calculated as the reciprocal of the frequency (1/f). It is measured in seconds and designated with the letter T.

Peripheral – a term designating the various kinds of devices that work in conjunction with a computer but are not necessarily part of the computer structure. Typically, peripherals refer to: printers, keyboards, monitors, scanners, CD ROM drives, and plotters.

Plant System status – refers to the information that informs about what is going on, through appropriate feedback within reasonable time.

Pre-commissioning – tests on the I&C instruments, equipment and cabling, prior to being powered.

Primary reference – a source of time and or frequency that is traceable to international standards.

Principle of no hidden data – applies to all the data available from plant systems to CODAC irrespective of data types and volume.

Proactive – to describe a person who took responsibility for his or her life, rather than looking for causes in outside circumstances or other people.

Process – in control engineering the process is the sum of all physical components that are monitored and controlled by the control system.

Process data – this includes both the scientific data flowing to the live database and engineering data used for monitoring.

Process Variable – a set of data elements or mathematical and/or logical combination of other process variables.

Program – a complete sequence of computer software instructions necessary to provide an application, solve a specific problem, perform an action, or respond to external stimuli in a prescribed manner.

Programmable Logic Controller (PLC) – a controller, usually with multiple inputs and outputs, that contains an alterable program. PLCs are diskless compact computers which include a set of hardware interfaces to connect to standard process control devices (I/O modules and Field Bus interfaces).

Programming Methodology (application development) – refers to the procedures for application design, development, testing and maintenance of software.

Property – properties are the smallest atomic quantities within a distributed object; a basic or essential attribute shared by all members of a class.

Proportional Integral Derivative (PID) Control – a PID loop controller is used in closed loop control to drive a measured parameter towards the defined set point. It creates a corrective output signal which is dependent on three factors; namely the current value of the error (i.e. difference between the measured value and the set point value), the integral of the error over a recent time
interval and the derivative of the error. A weighting, or tuning constant, is applied to each of these factors and these may be adjusted to optimise the performance of the PID loop.

[GL338] **Protocol** – an agreement about how and in what format data should be transmitted, especially across networks. Low level protocols define the electrical and physical standards to be observed and deal with the transmission and error detection and correction of the bit stream. High level protocols define an agreed method of exchanging information between components.

[GL339] **Prototyping** – a test system built to evaluate a particular implementation option, technology or to gain feedback from the end users. A prototype normally is a mock up, has only a subset of the functionality of the final system and is not required to be developed according to the same quality assurance procedures as for the production system.

[GL340] **PS autonomous operation** – refers to operation of plant system without CODAC interface availability.

[GL341] **PS I&C Integration** – refers to the process in which PS I&C are interfaced and tested with the other plant systems to ensure that they achieve the required plant system functionality.

[GL342] **PS I&C Manufacture** – the operation of making plant system I&C hardware and software from small components into integrated system as per the design document.

[GL343] **PXIe** – a rugged, open system for modular instrumentation based on PXI/Compact PCI, with special mechanical, electrical, and software features.

[GL344] **Real-time Data** – time-dependent data processed by a computer whose output data is capable of controlling other time-related events, such as traffic control. Real time is the actual time it takes for an event to occur.

[GL345] **Real-Time Ethernet** – enables high-speed, real-time communication on the basis of Ethernet transmission techniques.

[GL346] **Reference** – an arbitrarily selected point or section of a circuit or system to which the polarities and values of the circuit voltages are referred.

[GL347] **References** – documents that contain material that must be understood and used to implement the standard.

[GL348] **Reliability** – the assurance that a component will perform in a specified manner for a specified time under a set of specified conditions that include electrical, mechanical, thermal, and environmental stresses. The concept of reliability encompasses the elements of both quality and longevity.

[GL349] **Resolution** – defined as granularity of the clock; i.e. relates to the smallest difference in time which can be distinguished.

[GL350] **Review** – activity undertaken to determine the suitability, adequacy and effectiveness of an item to achieve established objectives.

[GL351] **SAT (Site Acceptance Tests)** – PS integration tests to determine whether a plant system satisfies its acceptance criteria at ITER on site.

[GL352] **Scan** – to sample, in a predetermined manner, each of a number of variables intermittently. The function of a scanning device is often to ascertain the state or value of a variable.

[GL353] **Scheduled Event or Pre-defined Event** – an event that occurs at a reference time.

[GL354] **Scientific data** – which consist of raw and processed data, used for real time control, display, offline analysis and reconstruction.

[GL355] **Scope** – the technical boundaries of the document. The scope explains what is covered in the document and may explain what is not covered in the document.

[GL356] **SDN (Synchronous Data Network)** – real-time communication mechanism between plant systems and CODAC for plasma control.

[GL357] **Sensor** – a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument.

[GL358] **Sequential Control** – computer control based upon a predefined chain of operations.
Server – a computer which, by means of network connections, carries out parts of a computing task on behalf of one or more remote computers.

Set – a set is a collection of elements which have no defined order. Each element may appear only once in set.

Shielding – the protective enclosure surrounding a transmission medium, system or component, designed to minimize electromagnetic interference (EMI/RFI). The shield is usually grounded.

Shutdown system – subsystem or plant system used to bring the Tokamak to safe shutdown conditions.

Signal Conditioning – the process of interfacing to a sensor/actuator. It includes amplifying and filtering its signal in order to make it ready for ADC / DAC.

Simplex – a data transmission mode that provides transmission in one direction.

Slave – a computer or peripheral device controlled by another computer.

Slot – the place in the computer or chassis in which a card or module can be installed.

Slow Control – performance requirements on the order of 100Hz.

Software – programs, languages, procedures, and documentation for a computer system. Software includes: operating systems (system software), language translators (assemblers, interpreters and compilers), subroutine libraries, application programs and the information in instruction manuals.

Software device – a collection of subroutines and data that constitutes the software interface to an I/O driver device.

Source – the equipment providing a signal to the input.

Source code – referred to as simply the "source" of program statements and contains variable declarations, instructions, functions, loops, and other statements that tell the application program how to function.

SQL (Structured Query Language) – a standard for expressing queries for relational database systems.

Status – the set of values of all the parameters (state, numeric read outs, flags...) that define the condition of a system, subsystem, or component.

Storage – in a computer, storage is the place where data is held in an electromagnetic or optical form for access by a computer processor. Storage implies a repository that retains its content without power.

Supervisory Control and Data Acquisition (SCADA) – a software tool used for developing applications for the supervision and control of field devices. The field devices are usually connected to the SCADA system through intermediate intelligent process controllers, e.g. PLCs.

Supplier – entity that provides goods or services to the ITER Organization.

Network switch – a hardware device that joins multiple computers together within one local area network (LAN).

Switch – a device that connects, disconnects, selects, or transfers one or more circuits.

Task (software) – a task is something that needs to be done. It is often implemented in a separate thread, but does not have to be. A process or execution of a program.

Task – an activity that needs to be accomplished within a defined period of time.

Timeout – a mechanism for terminating requested activity that, at least from the requester’s perspective, does not complete within the specified time.

Timescale – a linear measure of time from an epoch.

Top-Down Hierarchical Design – a hardware and/or software design approach that starts at the most general level of a machine or software program. It proceeds, step-by-step, to lower levels, adding details as the design progresses.
**Transducer** – a general term for a device that receives information in the form of one or more physical quantities, modifies the information and/or its form, if required, and produces a resultant output signal.

**Transition** – a relationship between two states indicating that an object in the first state will perform certain specified actions and enter the second state when a specified event occurs and specified conditions are satisfied. An allowable path between two states of an FSM.

**Transmission Control Protocol (TCP)** – a network protocol that enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.

**Trend** – a graphical representation of a time history plot of one or more parameters.

**Trigger** – an external stimulus that initiates one or more instrument functions. A digital signal that starts or times a hardware event (for example, starting a data acquisition operation).

**TTL Logic** – abbreviation for Transistor-Transistor Logic, a very typical medium speed digital technology.

**UDP (User Datagram Protocol)** – a "connectionless" protocol that makes one-way transmission of data in a packet data network having no provision for acknowledgement of packets received.

**Utility** – a software program designed to perform a computer system's routine housekeeping functions, like copying, deleting files, and/or providing techniques to simplify the execution of a program.

**Visualisation** – the method by which the system presents data to the user.

**Warning** – a warning alarm is defined to be an alarm which indicates an undesired condition of one or more devices.

**Access Time** – the length of time required for a binary word in the memory section of a computer to be read by the CPU, or the time to read data from a peripheral data storage area.

**Accessible** – a term applied to a device or function that can be used or be seen by an operator for the purpose of performing control actions, e.g., set point changes, auto-manual transfer, or on-off actions.

**Alphanumeric** – the term that defines the letters of the alphabet (A to Z) and the ten numerals (0 to 9). The term is generally used to mean any text data.

**Amplification** – the process of increasing the voltage, current, or power of an electrical or electronic signal.

**Baseband** – an un-modulated signal or band of signals.

**Battery** – an electrical device consisting of one or more cells which converts chemical or solar energy into electrical energy. A battery provides a source of steady-state DC voltage.

**Baud Rate** – a measure of speed of transferring information between two or more sections of a computer system.

**BNC** – a type of coaxial connector used in situations requiring shielded cable for signal connections and/or controlled impedance applications.

**Bootstrap (BOOT)** – a software program for initiating the operation of a computer.

**Boundary clock** – a boundary clock is a clock with more than a single PTP port, with each PTP port providing access to a separate PTP communication path.

**Buffer (electronic)** – a digital logic circuit inserted between other digital circuits to reduce circuit interaction and/or to provide amplification of a digital signal.

**Buffer (communication)** – an intermediate storage circuit used to compensate for a difference in baud rate or, to compensate for different times of occurrence of different events or instructions.

**Bus Controller** – a circuit that generates commands and control signals for sequencing and timing of the data transmitted on a bus.

**Cache** – a high-speed buffer memory that is similar to a scratch pad memory, but has a larger capacity; it is located in the CPU.
Central Processing Unit (CPU) – the section(s) in which all the processing circuits of a computer are located. It incorporates a control unit and an ALU.

Characteristic – non changeable (static) data associated with a device property. Characteristics differ from attributes in that they read only and rarely change (are compiled in).

Circuit – a single component or group of interconnected components powered by a source of voltage and configured according to specified rules. A circuit performs a specific or a predetermined general task.

Coaxial Cable – a cable that has one conductor (shield) completely surrounding the other (centre conductor), the two being coaxial and separated by an insulator.

Component Video – a three-channel video signal wherein the luminance, hue and colour saturation information are carried as R, G and B (Red, Green and Blue) signals or as one of several variations of colour difference signals.

Composite Video – a single video signal carrying combined luminance, chrominance and raster synchronizing information.

Conceptual Design Review (CDR) Meeting – a formal design review meeting conducted at an early stage of the design phase to assess that the requirements of the system have been properly identified, the concept selected minimises the overall construction and operation risks and that the boundary of the systems have been established.

Conditions-based trigger – a condition is a logical statement about the state of the system when satisfied, that generates the triggers.

Confignurable – a term applied to a device or system whose functional characteristics can be selected or rearranged through programming or other methods.

Context switch – the execution is changed from one context (thread) to another.

Control Bus – a set of transmission lines whose function is to carry synchronization signals and control data as part of the system bus.

Copyright – the exclusive right, granted by law to make copies, license, and otherwise exploit a published work.

Counter – a circuit whose output(s) change state in a specified sequence on receiving appropriate input signals.

Cut through – the switch reads only up to the frame's hardware address before starting to forward it. There is no error checking with this method.

De facto standard – standards that have come into use by general acceptance, custom or convention but have no formal recognition.

Dead band – the amount a parameter value may vary before it is considered by the control system to have changed.

DEBUG – the process of detecting, locating, and correcting a problem in a software program or hardware.

Decibels (dB) – the logarithmic ratio between two signal levels.

Design Coordinator – the person appointed to coordinate and manage the design activities related to a discipline or a group of systems in ITER.

Design Developer – the person responsible for the product or process’ design and development in ITER.

Detailed Design Review (DDR) and Final Design Review (FDR) Meeting – a formal design review meeting conducted to ensure that the detailed design is complete. The design is properly documented in technical specifications and drawings are ready to be released for fabrication.

Digital Voltage – a discontinuous or step-function electrical pulse characterized by an instantaneous change from zero to some finite level, either in a positive or negative direction with respect to a reference.
Direct Current (DC) – an electrical current or voltage with a constant direction (polarity) with respect to a fixed reference. DC can be either positive or negative.

Direct Memory Access (DMA) – a method of transferring blocks of data directly between an external device and the computer system memory without the need for intervention by the CPU.

Down Time – a period of time during which a system or computer is not functioning.

Editor – a program for preparing and/or modifying a source program or other file by addition, deletion, or change.

EMI (Electromagnetic Interference) – a term that defines unwanted electromagnetic radiation from a device which could interfere with desired signals in test or I&C equipment. RFI (Radio Frequency Interference) and EMI are often used interchangeably.

Functional grouping – for the purpose of the grouping of the components into the subsystems functional grouping, such as piping lines, instrument loops, HVAC duct lines, which are implemented in the design and will be assigned unique identifiers.

Hertz (Hz) – the unit of measurement of the frequency.

Hexadecimal – the base 16 number system using 16 symbols (0 to 9 and A to F) to represent 16 decimal numerals (0 to 15).

High Level Language (HLL) – a programming language (source code) consisting of a unique group of symbols and command statements representing a series of machine operations.

I&C cabling – addresses optical or electrical external connections of the I&C cubicles.

I&C wiring – addresses optical or electrical internal connections within I&C cubicles only.

Impedance – the electrical characteristic of a transmission circuit expressed in Ohms.

Industry Standard – industry-developed document that establishes requirements for products, practices, or operations.

Interactive – an interactive command can be used by an operator to override or choose an automated parameter selection.

Managed switches – these switches have one or more methods to modify the operation of the switch.

Memory Address – the location of digital information in the memory unit of a computer system, or a digital code that designates this location.

OO (Object Oriented) – object oriented programming (OOP) refers to a type of programming that combines data structures with functions to create reusable objects.

Ordinary clock – a clock that has a single PTP port in a domain and maintains the timescale used in the domain.

Parent clock – the master clock to which a clock is synchronized.

PBS (Plant Breakdown Structure) – the breakdown of the ITER plant in systems and subsystems, that is used forth the identification of all physical parts of the ITER plant as described in the “ITER Plant Breakdown Structure” (28WB2P).

PCI (Peripheral Component Interconnect) – a high-performance expansion bus architecture originally developed by Intel to replace ISA and EISA.

Plant System Communication – addresses the networks and field buses required for plant systems I&C internal connections of the slow and fast controllers, only.

Polling – a process in which a number of peripheral devices, remote stations, or nodes in a computer network are interrogated, one at a time, to determine if service is required.

Port – an input/output channel (either parallel or serial), terminated at a connector on the computer.

Power – the rate at which work is done and measured in watts (W).
Power over Ethernet or PoE – technology describes a system to safely transfer electrical power, along with data, to remote devices over standard category 5 cable in an Ethernet network. It does not require modification of existing Ethernet cabling infrastructure.

Pre-emption – when a thread is interrupted, and the execution is handed over to another thread using a context switch.

Preliminary (Development) Design Review (PDR) Meeting – a formal design review meeting conducted during the development phase of the design to monitor the progress of the design and to ensure that the requirements are properly defined and documented; a design concept that meets those requirements has been developed and supporting analyses and R&D are being carried out; and a firm basis exists to proceed with final (detailed) design.

Proprietary Standards – documentation by a commercial entity specifying equipment, practices, or operations unique to that commercial entity.

Protected Area – an area equipped with appropriate ESD protective materials and equipment. It provides a site where ESD voltage is limited below the ESD sensitivity level of the component or equipment being handled or manufactured.

PTP domain – a PTP domain is a collection of one or more PTP sub domains. A sub domain is a logical grouping of 1588 clocks that synchronize to each other using the PTP protocol.

PTP port – a logical access point of a clock for PTP communications to the communications network.

Readiness Review (RR) Meeting – a review meeting conducted to ensure that all preparations for starting the next phase of activity in the project lifecycle (e.g. assembly, installation, testing, or operations) have been successfully completed.

Real Time – means synchronized with the process in a predictive manner (delays and jitters less than 1 msec).

Recognized standard time source – a source external to PTP that provides time and or frequency as appropriate that is traceable to the international standards laboratories maintaining clocks.

Register – a temporary storage unit for quick, direct accessibility of a small amount of data for processing.

Regression test – a test performed on a modified program to ensure that changes are correct and have not adversely affected unchanged portions of the program.

Remote Procedure Call (RPC) – a call to a routine that results in code being executed in a different process from the one where the request originated.

RFM (Reflective Memory) – real-time local area networks in which each computer always has an up-to-date local copy of the shared memory set. RFM provides highly deterministic data communications.


RS-485 – a serial data interchange standard using differential communication channel.

Service (software) – refers to a set of related software functionality, together with the policies that should control their usage.

Service Routine – a set of instructions for performing a programmed operation, typically, in response to an interrupt command.

Simulation – the act of imitating the behaviour of some situation or some process by means of something suitably analogous. In computer science, the technique of representing the real world by a computer program; "a simulation should imitate the internal processes and not merely the results of the thing being simulated".

Software life cycle – the period of time that begins when a software product is conceived and ends when the software is no longer used. The software life cycle typically includes concept, requirements, design, implementation, test, installation and checkout, operation and maintenance and, sometimes, retirement.
[GL475] **Standard** – a standard is a document that defines the characteristics of a product, process or service, such as dimensions, safety aspects, and performance requirements.

[GL476] **Standardization** – the use of common products, processes, procedures, and policies to facilitate attainment of system objectives.

[GL477] **State and monitoring information** – engineering data that arises at each level and is sent to the CODAC live database and then for monitoring/archival.

[GL478] **Store and forward** – the switch buffers typically performing a checksum on each frame before forwarding it on.

[GL479] **Subcontractor** – an entity that performs work for the supplier.

[GL480] **Subroutine** – a short program segment that performs a specific function and is available for general use by other programs and routines.

[GL481] **Synchronized clocks** – two clocks are synchronized to a specified uncertainty if they have the same epoch and their measurements of the time of a single event at an arbitrary time differ by no more than that uncertainty.

[GL482] **Synchronous Communication** – a method of transferring binary data, in serial form, between computers or between a computer and its peripherals.

[GL483] **Syntax** – a set of grammatical rules defining valid use of specific commands or instructions in a computer language.

[GL484] **TAI (International Atomic Time)** – unlike UTC, TAI does not account for leap seconds. Therefore, TAI is the time system employed by network standards for which leap seconds may be problematic.

[GL485] **Technical Report (TR)** – a document that describes the process, progress, and or results of technical or scientific research or the state of a technical or scientific research problem.

[GL486] **Technical Specification (TS)** – outlines all the information needed to define the technical requirements of a site, including platform, system, hosting arrangements.

[GL487] **Temperature Coefficient (TC)** – the change in the characteristic of a component which occurs because of a change in temperature.

[GL488] **Test point** – a process connection to which no instrument is permanently connected, but which is intended for the temporary or intermittent connection of an instrument.

[GL489] **Thread** – a thread is the primitive that can execute code. It contains an instruction pointer (program counter) and sometimes has its own stack.

[GL490] **Toggle** – to switch back and forth between two states or conditions of operation, as in a toggle switch.

[GL491] **Time Division Multiple Access (TDMA)** – a channel access method for shared medium networks. It allows several users to share the same frequency.

[GL492] **Transparent clock** – a device that measures the time taken for a PTP event message to transit the device and provides this information to clocks receiving this PTP event message.

[GL493] **Unmanaged switches** – these switches have no configuration interface or options. They are “plug and play”.

[GL494] **Voltage** – the electromotive force that exists across a voltage source (supply voltage) or a load in a circuit. Its unit of measurement is a Volt.

[GL495] **Watt** – the unit of measurement for electrical power.

[GL496] **WBS (Work Breakdown Structure)** – a tree-like structure that is used to define and organize the total scope of the ITER project as described in the “MQP - ITER Organization Breakdown Structures” (22F49Q).

[GL497] **Workstation** – a desktop computer, normally more powerful than a normal PC and often dedicated to a specific task, such as graphics.

[GL498] **Zoom** – the process of proportionately enlarging or reducing an image displayed on a computer monitor.