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Interface Sheet-IS

IS-41-45-008 – Interface between V3PS and CODAC

IS-41-45-008

Approval Process			
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Change Log			
IS-41-45-008 – Interface between V3PS and CODAC (CCSGVS)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v0.0	In Work	11 Oct 2024	
v1.0	In Work	14 Dec 2025	First Version
v1.1	Signed	16 Dec 2025	- Preliminary Version
v1.2	In Work	17 Dec 2025	updated with the comments of Bjoern taken into account
v1.3	Signed	18 Dec 2025	updated protocols and standards figure
v1.4	Approved	22 Dec 2025	typos corrected, pictures updated according to review comments

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1 Purpose

This document *IS-41-45-008 Interface Sheet (IS) between Vertical Stabilization 3 Power Supplies (VS3-PS) Plant System of PBS 41 and PBS 45 (CODAC)* is to define the interfaces data which will be used for the design of the both interfacing system: CODAC (PBS 45) and PBS 41.V3 in agreement with ICD-41-45.

2 Scope

The scope of this document is the interface points identified in the concerned ICD [AD1] between CODAC System (PBS 45) and Coil Power Supply & Distribution – VS3 Power Supply (PBS41.V3). This interface sheet IS-41-45-008 between CPS – VS3 (PBS 41.V3) and CODAC (PBS 45) is part of ICD [AD1]. All recommendations and updates about the IS are listed in the schedule of the ICD.

This document will identify:

- The physical boundaries between PBS 41 VS3-PS system (41.V3) and PBS 45 during Design, Manufacturing (including FAT) and Integration phases.
- Identify the functional interface between CBS MAG-V3PS and CODAC (PBS 45) during Design, Manufacturing and Integration phases.
- Identify the software interfaces and responsibility boundaries in entire I&C life cycle of the project.

These are the data to be specified in this Interface Sheet:

- The list of milestones that change the required maturity of this IS
- The connection points with central I&C networks
- The I&C Integration Kits provided by PBS45
- The list of controllers
- The list of cubicles housing the controllers
- The ranges of IP addressed to be used
- The functions used in variables

In addition, the following data shall be specified in the associated Interface Data Sheet [AD2]:

- List of variables
- List of external variables
- Definition of the PSOS variables with COS/PSOS mapping

2.1 Description of Interfacing Systems

2.1.1 Vertical Stabilization 3 Power Supplies (V3-PS) System

The Vertical Stabilization 3 Power Supplies (V3-PS) system takes the power from 22 kV Pulse Power Electrical Network (PPEN) feeder and provides controlled voltage/current to the 2 VS in-vessel conventional copper coils that are implemented in the Vacuum Vessel. The VS3 coil circuit is composed of the upper and lower VS coil, each comprising 4 coil turns, connected in an anti-series connection with the two VS3 power converters.

PBS 41.V3 system is broken down in the following sub-systems at CBS Level 3:

Table 1: CBS Breakdown

CBS L1	CBS L2	CBS L3	Description	PA	Staged Approach Phase[1] [RD10]
MAG	V3PSS		Vertical Stabilization 3 Power Supplies (VS3-PS)	TA - TBD	SRO
		CC00	Conventional control	TA - TBD	SRO
		IL00	Interlock control	TA - TBD	SRO

The CBS L3 is divided in CC00 for conventional control and IL00 for interlock control to be noted that interlock control equipment (e.g. boards, cubicles, …) will also provide data to convention control (e.g. monitoring information, PCS data). Conversely, equipment assigned to conventional control will not contribute in any form to interlock control.

The interfacing components belonging to the PBS are listed in following table

Table 2: PBS 41. EL- Level 3

PBS ID	PBS Description
41.V3.00	VS3 Common
41.V3.BB	VS3 IVC Busbars, Supports, Links and Linkboard
41.V3.BE	Extension busbars, supports and links
41.V3.CH	Charger
41.V3.CP	Capacitor Bank
41.V3.CR	Crowbar
41.V3.DL	Dummy Load
41.V3.IC	Plant System I&C
41.V3.IV	Inverter
41.V3.SA	Mechanical structures

2.1.2 CODAC

CODAC (PBS 45) system is the central (supervisory) control system for the conventional plant control systems of the ITER I&C architecture. PBS 45 provides the Central I&C network and the I&C Integration Kits as the interface infrastructure for the software and hardware, to ensure communication between CODAC and the Plant systems. The CODAC system provides plant-wide data monitoring, alarm handling, error logging, data visualization, data handling, data storage, global operation state management, operation schedule management, automated pulse execution and plasma control functions for the overall ITER operation.

The interfacing components belonging to the PBS are listed in following table

[1] SRO = Start of Research Operation, DT-1 = Deuterium-Tritium 1 (DT-1), DT-2 = Deuterium-Tritium 2, see [RD10]

Table 3: PBS 45 - Level 3

PBS ID	PBS Description
45.01.PS	PS Support Server
45.01.AS	Application Server
45.01.HP	High Performance Computer
45.01.DS	DB Server and Storage
45.02.ON	Networks: PON
45.02.TN	Networks: TCN
45.02.DN	Networks: DAN
45.02.SN	Networks: SDN
45.03.D1	Diagnostics Measurement System
45.05.11	Bldg 11 network infrastructure
45.05.13	Bldg 13 network infrastructure
45.07.00	CODAC Common Component
45.08.PC	Plasma Feedback Control

2.2 Stage Approach Phase

The Project Phases associated with interfacing systems are described in [AD5] and are in-line with staged approach configuration [RD10]

2.3 Interface Point Definitions

Information related to interface point definitions are included in [AD5].

3 Definitions

Table 4: Abbreviation

Abbreviation	Definition
CBS	Control Breakdown Structure
CNP	Central I&C Network Panel
CODAC	Control Data Access and Communications
CCS	CODAC Core System
CS-Studio	Control System Studio
CU / Cubicle	Electrical cabinet or enclosure
MAG	CBS 1 for Magnets
MAG-V3PS	CBS1 – CBS 2 – Vertical Stabilization 3 Coil Power Supplies (VS3-PS)
DDD	Design Description Document
DAN	Data Archiving Network
FAT	Factory Acceptance Test
GUI	Graphic User Interface

I&C	Instrumentation & Control
I/O	Input/ Output
IDS	Interface Data Sheet
IO	ITER Organization
IO-CT	ITER Organization – Central Team
IS	Interface Sheet
ICD	Interface Control Document
LR	Type of fiber optics cable and connector, 10GBASE-LR (long reach)
PA	Procurement Arrangement
PBS	Plant Breakdown Structure
PLN	Plant Local Network
PON	Plant Operation Network
POS	Plasma Operation State
PS	Plant System
PSH	Plant System Host
SAT	Site Acceptance Test
SDD	Self-Description Data
SDN	Synchronous Database Network
SDS	System Design Specification
SMP	Strategic Management Plan
SRD	System Requirements Document
SRS	System Requirement Specification
SVN	Subversion
TCN	Time Communication Network
TS	Thermal Shield
V3 / VS3	Vertical Stabilization 3
For a complete list of ITER abbreviations see ITER Abbreviations ITER_D_2MU6W5	

4 References

4.1 Documents applicable to the interfacing products

Table 5: Applicable Documents

Ref	Document	Reference	Version
[AD1]	ICD between PBS 41 and PBS 45	ITER_D_2NKSW9	3.0
[AD2]	IDS-41-45-00x Interface Data Sheet between PBS 45 CODAC and PBS 41.V3	TBD	TBD
[AD3]	SRD-41(Coil Power Supply and Distribution) from DOORS	ITER_D_28B6XQ	6.0
[AD4]	SRD-45 (CODAC) from DOORS	ITER_D_28C2HL	4.0
[AD5]	Interfacing cubicles of IS-41-45-008	ITER_D_DMGWHC	1.0
[AD6]	PBS 41 (Except PP) - Coordinates of equipment (except EE in the TKC)	ITER_D_CRM2SE	1.9
[AD7]	IS-47-41-005 Interface Sheet between PBS47 (PCS) and PBS41 (CPSS-VS3) - Architecture	ITER_D_7PE9R4	1.1

4.2 Reference Documents

Table 6: Reference Documents

Ref	Document	Reference	Version
[RD1]	Plant Control Design Handbook (PCDH)	ITER_D_27LH2V	7.1
[RD2]	Integration Kit for PS I&C	ITER_D_C8X9AE	1.2
[RD3]	Physical interface points between CODAC and the other plant systems for CODAC networks	ITER_D_RKCF76	1.1
[RD4]	CODAC Core System Application Development Manual	ITER_D_33T8LW	5.12
[RD5]	ITER I&C Network IP Address Scheme	ITER_D_UF5ZB9	1.2
[RD6]	ITER Control Breakdown Structure (CBS)	ITER_D_9TYFWC	6.0
[RD7]	Project Requirements (PR)	ITER_D_27ZRW8	7.1
[RD8]	Technical Specifications for PON and TCN access switches	ITER_D_RRDHL9	1.0
[RD9]	PLC Software Engineering Handbook	ITER_D_3QPL4H	3.1
[RD10]	Staged Approach Configuration - PBS Level 3	ITER_D_SNE6G8	4.1
[RD11]	OPC UA Integration User Manual	ITER_D_32N6MJ	1.3

5 Interface Requirements[2]

5.1 General interface requirements

[41.V345-008i001-R] The Conventional control system in terms of architecture, hardware and software shall be homogeneously designed in line with Central I&C system and architecture guidelines defined in PCDH

[41.V345-008i002-R] The operation, maintenance, installation and commissioning requirements of the control cubicles and related network infrastructure shall be considered for designing the systems and interfaces.

[41.V345-008i003-R] PBS 45 shall provide an I&C Integration Kit [RD2] to PBS 41.V3. The integration kit shall help 41.V3 build consistent plant systems. The integration kit consists of an industrial computer, industrial network switch, cubicle health monitoring system and a set of accessories. The kit also has high performance network interface boards as per the architecture of the system. Industrial computer of the kit hosts PSH and mini-CODAC with CODAC Core System and use cases installed.

[41.V345-008i004-R] CBS MAG.V3PS.CC00 (Conventional Control) shall operate under the supervision of CODAC. System CBS MAG.V3PS.IL00 (Interlock Control) shall operate under the supervision of CIS but also provides data to CODAC and commands to reset interlocks is sent and confirmed from CODAC.

[41.V345-008i005-R] PBS41.V3 and PBS 45 shall meet the requirements of the PBS41 SRD [AD3], and the CODAC SRD [AD4] respectively.

[41.V345-008i006-R] All the rules and guidelines specified in Plant Control Design Handbook [RD1] shall be followed. PCDH also specifies deliverables applicable to ITER plant system I&C during various phases of I&C life cycle.

5.2 Physical Interface

This section defines the physical interface between components of the 41.V3 system and components of the CODAC during all stages of I&C Life cycle, those being: Design, Manufacturing, Integration and Operation Phase.

41.V3 system interfaces to the following central I&C networks owned by CODAC: PON, TCN, SDN, DAN. PBS 41.V3. I&C cubicles connect to central I&C networks through Central I&C network Panel (CNP). The physical interface points of these networks are depicted in Figure 1. Note that the figure only defines the scope for cabling but not for the supply of components. Please refer to [RD3] for further details on boundary points and different network configurations.

[2] The numbering of the requirements is [41.V345-008iNNN-R/I] for PBS **41.V3** and PBS **45**, -008 for this IS (**008**), i for **i**ndex (number) and iNNN with NNN as consecutive number and -R as **R**equirement or -Info as **Info**rmation. Requirements with "[…] PBS45 shall […]" have to be met by PBS45, all other Requirements have to be met by PBS41.V3 / supplier.

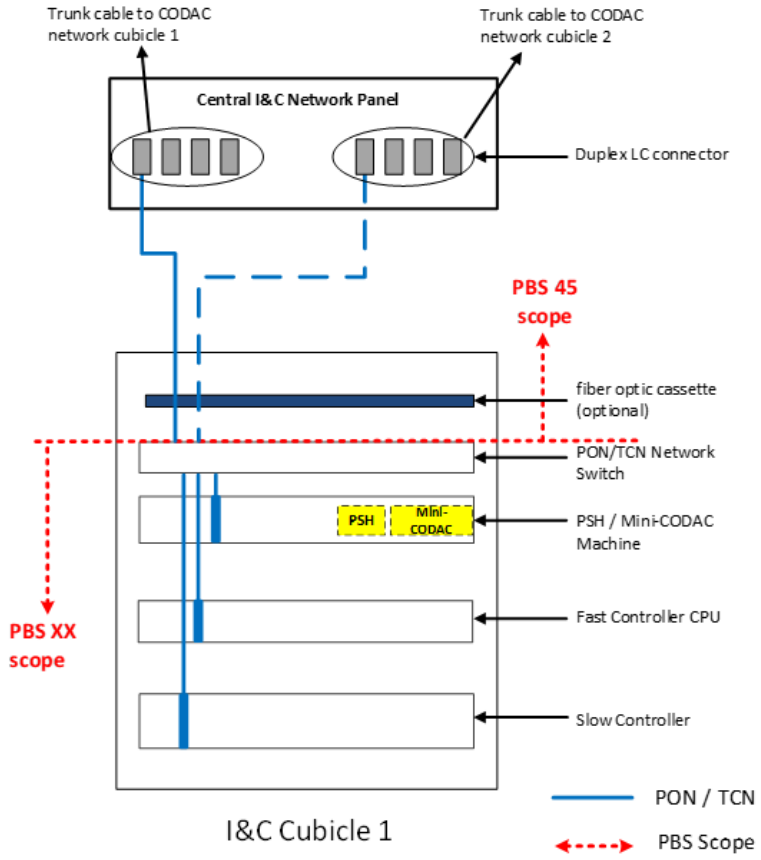

Figure 1: Physical Network Interface Scope for Single Cubicle (to be adapted to the applicable case as per https://user.iter.org/?uid=RKCF76)

[41.V345-008i001-Info] The PSH[3] and mini CODAC[4] are provided by IO, but their operational scope and management belongs to PBS 41.V3. That is, all processes and functions running in these components are to be developed, commissioned, and managed by 41.V3.

[41.V345-008i002-Info] The PSH is foreseen only for off-site usage. In the Installation and I&C Integration Phase described in 5.2.8, the PSH virtual machine will be moved from the I&C Kit and installed on a CODAC virtual machine.

[41.V345-008i003-Info] The Mini Codac is not to be used in the Installation and I&C Integration Phase described in 5.2.8 and later.

[41.V345-008i004-Info] The cables connecting plant system I&C cubicles to PBS 45 CNP are duplex Single-Mode Fiber (SMF) optic patch cables with LC connectors on both ends for all networks. Hereinafter, the cable is referred to as SMF patch cable. Please be reminded of [41.V345-008i0035-R] and [41.V345-008i0014-Info] where the optional fiber optic cassette might be added. The physical interface points for each network are described as below:

5.2.1 Interface Point - PON (IP-41.V3-45-01)

[41.V345-008i007-R] On every PBS 41.V3 I&C cubicle interfacing to the CODAC network, PBS 41.V3 shall procure and deploy an IO approved network switch to interface to PON and TCN.

[41.V345-008i008-R] In particular, the PBS 41.V3 I&C network switches shall meet the technical requirements defined in Technical Specifications for PON and TCN access switches [RD8].

[3] The PSH is part of the I&C Kit. It is a virtual machine hosted on the same physical machine together with the Mini CODAC.

[4] The Mini CODAC is part of the I&C Kit, it is intended only for stand-alone tests off-site, e.g. for the FAT.

The uplink ports of the switches shall meet the following requirements to interface with PON and/or TCN:

[41.V345-008i009-R] The ports shall be optical Gigabit Ethernet ports

[41.V345-008i0010-R] The ports shall have LC-type connectors.

[41.V345-008i0011-R] The ports shall operate at a wavelength of 1310 nm

[41.V345-008i0012-R] For every PON connected PBS 41.V3 I&C cubicle, PBS 45 will provide two PON redundant SMF patch cables from the CNP to the 41.V3 network switch inside the I&C cubicle. The interface point is on the PBS 41.V3 network switch.

[41.V345-008i005-Info] The cabling of PON within an I&C cubicle or between I&C cubicles of PBS 41.V3 shall be in the scope of PBS 41.V3.

[41.V345-008i006-Info] All controllers / servers which shall be remotely accessible for administration or configuration purposes would require to be accessible via PON.

[41.V345-008i007-Info] All controllers / servers / active components which need a remote terminal or remote console[5] for maintenance purposes would require to be accessible via PON.

[41.V345-008i008-Info] The standard communication protocol for control, commands and monitoring of status is EPICs based (see [RD1]). Alternatively OPC UA can be used, see [RD11].

5.2.2 Interface Point - TCN (IP-41.V3-45-02)

[41.V345-008i0013-R] For every TCN connected 41.V3 I&C cubicle, PBS 45 shall provide two TCN redundant SMF patch cables from the CNP to the 41.V3 network switch inside the I&C cubicle. The 41.V3 network switch is the same used to implement the PON interface. The interface point is on the 41.V3 network switch.

[41.V345-008i0014-R] The cabling of TCN within an I&C cubicle or between I&C cubicles of PBS 41.V3 shall be in the scope of PBS 41.V3.

[41.V345-008i0015-R] Specific TCN software required by the TCN interface shall be supplied by PBS 45.

[41.V345-008i009-Info] Controllers requiring high precision time synchronization would require a TCN interface to synchronize with absolute ITER time. Alternative would be the distribution of a synchronized clock signal by a TCN synchronized device[6].

5.2.3 Interface Point - SDN (IP-41.V3-45-03)

[41.V345-008i0016-R] Specific hardware & software required by the SDN interface shall be supplied by PBS 45.

[41.V345-008i0017-R] PBS 45 shall provide two redundant SMF patch cables from the CNP to each SDN network card of a plant system controller. The physical interface point is on the SDN network card.

The full system performance can be only evaluated when integrated with the central systems during acceptance testing (SAT) in Installation and I&C Integration Phase. Testing is not possible during FAT.

[41.V345-008i0018-R] The time critical interface between PBS47 and PBS41 is technically based on this interface. All setpoints as well as current and voltage read backs have to be transmitted via an SDN Interface Point.

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[5] For remote console access - if foreseen – KVMoIP (requiring PON) is recommended. Permanently installed in-cubicle KVMs are not recommended as the physical access is restricted.

[6] E.g. a pps (pulse per second) generating device with TCN enabled synchronization

[41.V345-008i0010-Info] The usage of different technical solutions to propagate time critical data from the SDN interface point to the actuators and sensors is possible, as long as the interface via SDN to PCS[7] and the overall closed loop control requirements meets the performance requirements (see [AD3][AD7] .

5.2.4 Interface Point - DAN (IP-41.V3-45-04)

[41.V345-008i0019-R] Specific hardware and software required by DAN interface shall be supplied by PBS 45.

[41.V345-008i0020-R] PBS 45 will provide two redundant SMF patch cables from CNP to each DAN network card of plant system controller. The physical interface point is on the DAN network card.

[41.V345-008i0021-R] PBS 45 will deliver the number of interfaces required by PBS 41.V3

[41.V345-008i0011-Info] This network access point is intended for the transmission of science, performance measurement and high bandwidth technical data to a permanent data storage for examination, analysis and off-site optimization purposes. All systems producing these kind of data, e.g. data acquisition systems or calibration systems are recommended to use this interface point.

5.2.5 Interface Point -PLN (IP-41.V3-45-05)

[41.V345-008i0022-R] PBS 41.V3 shall deploy a Plant System Local Network (PLN) for communications between the controllers in an independent manner from central I&C networks, Even though PLN is not connected to the central I&C networks, PBS 41.V3 shall submit the IP addresses so that they shall be centrally managed by IO-CT.

[41.V345-008i0023-R] In particular, the PBS 41.V3 I&C network switches shall meet the technical requirements defined in Technical Specifications for PON and TCN access switches [RD8].

The uplink ports of the switches shall meet the following requirements in order to interface with PON and/or TCN:

[41.V345-008i0024-R] The ports shall be optical Gigabit Ethernet ports

[41.V345-008i0025-R] The ports shall have LC-type connectors.

[41.V345-008i0026-R] The ports shall operate at a wavelength of 1310 nm

[41.V345-008i0012-Info] A direct configuration of PLN and PON is not enabled. A communication is only possible via a host with active network connections into both networks.

[41.V345-008i0013-Info] Networks with supplier specific protocols can be implemented using PLNs.

5.2.6 Design Phase

All I&C physical interfaces are to be defined in the design phase.

CBS MAG.V3PS interfaces to following I&C networks owned by CODAC: PON, TCN, SDN, DAN. The interfacing points and the interface cubicles with PBS45 are listed in the section 6.1

[41.V345-008i0027-R] In the design phase, PBS 41.V3 shall provide the list of controllers and their connected networks including both central I&C networks and private plant networks. The controllers shall be named according to the ITER naming convention, the cubicle and the location as well as the assigned IP address shall be stated.

[7] PCS – Plasma Control System, the technical platform of PBS47 is implemented in PBS45 and interfaced via SDN

[41.V345-008i0028-R] As stated in PCDH [RD1], networks shall be centrally managed by IO-CT, including the assignment of IP addresses.

[41.V345-008i0029-R] The IP address ranges PON-MAG and PLN-MAG are shared by the CBS-1 MAG, while the IP address ranges TCN, SDN and DAN shall be shared by all CBS. All the address ranges shall be maintained by PBS45 [RD5].

[41.V345-008i0030-R] Controller interface names and IP addresses shall be registered by PBS 45 in the central IP Address Management (IPAM) tool. MAC addresses are not required at this stage.

5.2.7 Manufacturing

[41.V345-008i0031-R] PBS 45 supplies I&C Integration Kits [RD2] to PBS 41.V3.

[41.V345-008i0032-R] Responsibility of configuration, maintenance and operation of Integration Kit shall pass to the supplier from receipt of the kit till PS Integration.

[41.V345-008i0033-R] The Integration kit shall be used for Factory Acceptance Test (FAT) of the system and should be returned to IO along with plant system I&C delivery.

[41.V345-008i0034-R] Given that there will be diagnostic specific software running in the PSH the management of such software shall be performed in the scope of the PBS41.V3 commissioning activities.

[41.V345-008i0035-R] PBS 41.V3 shall reserve a space of 1U in each I&C cubicle for CODAC, upon commissioning in IO premises, the space shall allow CODAC to install a fiber optic cassette if deemed necessary to improve the cabling.

[41.V345-008i0014-Info] If required, the fiber optic cassette will be in the scope of CODAC

[41.V345-008i0036-R] PBS 41.V3 shall provide MAC addresses of network interfaces for all controllers along the assigned IP addresses at the completion of FAT. PBS 45 will register or update MAC addresses in IPAM.

5.2.8 Installation and I&C Integration Phase

[41.V345-008i0037-R] PBS 45 shall install Central I&C network infrastructure.

[41.V345-008i0038-R] PBS 45 shall provide Central I&C Network Panel (CNP) in the vicinity of I&C cubicles of PBS 41.V3

[41.V345-008i0039-R] PBS 45 shall also provide network cables from CNP to I&C cubicles of PBS 41.V3 according to the connection points defined in Section 6.1.

[41.V345-008i0015-Info] During integration the network interfaces between VS3 plant I&C and central networks shall be established, I&C control and monitoring shall be established with CODAC terminals and networks.

In the subsequent phases, the physical interface of CODAC network is maintained.

5.2.9 Operation Phase

[41.V345-008i0040-R] During operation phase, Network Switches as well as PSH shall be maintained by PBS 45.

5.2.10 Decommissioning Phase

[41.V345-008i0016-Info] The connections at the physical interface point shall be disconnected during decommissioning and shall be decommissioned separately as per respective systems. The PBS 41.V3 components shall be decommissioned as per PBS 41.V3 Decommissioning plan and PBS 45 components shall be decommissioned as per PBS 45 Decommissioning plan.

5.3 IP-41.V3-45-06 : Functional Interface

CBS MAG.V3PS plant system I&C has functional interface with CODAC (PBS 45) for monitoring and control of 41.V3 system.

[41.V345-008i0041-R] Functionally CBS MAG.V3PS interfaces with CODAC:

a) To provide status of plant system PBS 41.V3 to CODAC: this includes plant system variables, alarms and archiving data.
b) To receive operator/ central command from CODAC to CBS MAG.V3PS.
c) To receive configuration parameters from CODAC to CBS MAG.V3PS.
d) To provide plant system health monitoring status to CODAC.
e) To manage plant system operating states through operation request and operation states.
f) To connect to other plant systems for monitoring and control, either through collaboration data or global data exchange.
g) All types of logical data must be allocated to corresponding network as mentioned in section 2.2 of ICD between PBS 41.V3 and PBS 45[AD1].
h) To receive time critical voltage / current setpoints for the converter power supplies from PCS via SDN and report current and voltage readings et. al. via SDN to PCS.
i) To record high volume data and send to archive via DAN.

5.3.1 Design Phase

[41.V345-008i0042-R] Functional interfaces are identified at high level in the first phases phase. PBS 41.V3 shall provide the list of process variables interfacing with CODAC system.

[41.V345-008i0043-R] PBS 41.V3 shall provide the list of functions to which the variables are associated and that shall match the CBS breakdown for CBS 41.V3. The list of functions is defined in section 6.3.

[41.V345-008i0044-R] PBS 41.V3 shall provide a list of all software artifacts to be developed and provided.

[41.V345-008i0017-Info] The protocols and standards used to interface with the Central I&C systems are mentioned in Figure 2 The “plug & play” protocols and standards are natively supported by the ITER Central I&C systems and networks. The “possible” interfaces require additional measures to interface with the ITER central I&C.

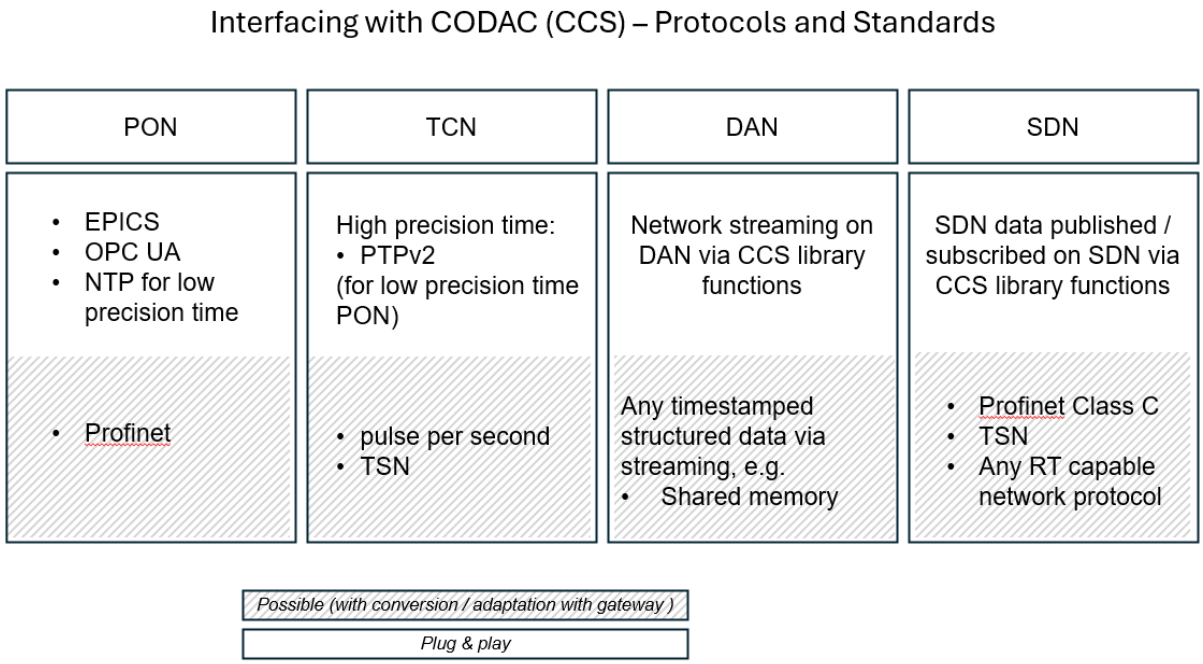

Figure 2. Protocols and Standards interfacing with CODAC (CCS).

5.3.2 Manufacturing

[41.V345-008i0045-R] CBS MAG.V3PS shall be manufactured by PBS 41.V3 (or supplier) using I&C integration kit[8].

[41.V345-008i0046-R] PBS 41.V3 shall provide list of variables, control units and I&C cubicles to PBS 45.

[41.V345-008i0047-R] PBS 41.V3 (or supplier) shall configure variables using the SDD toolkit, provided by PBS45.

[41.V345-008i0048-R] PBS 41.V3 (or supplier) shall deliver the SDD configuration data prior to respective FAT, as well as at the completion of FAT.

[41.V345-008i0049-R] The data shall be saved and maintained into central by PBS 45.

[41.V345-008i0050-R] Plant system I&C application program and executable software artefacts are in SVN.

5.3.3 PS Integration Phase

[41.V345-008i0051-R] PBS 45 shall provide services to connect other plant system I&C with CBS MAG.V3PS for monitoring and/or control.

[41.V345-008i0052-R] Detailed list of variables, and operation states is available in Interface Data Sheet IDS-41-45-00x [AD2]

[41.V345-008i0053-R] PBS 45 shall ensure the functional usability of the connection points defined in Section 6.1. according to an agreed schedule during the PS Integration Phase.

[41.V345-008i0054-R] PBS 45 shall provide the configuration and installation of all controllers with the Plant system I&C application program and executable software artefacts provided and archived in SVN.

[8] This includes the design and configuration of the GUIs based on the CODAC Core System (CCS) for displaying the system status and sending commands to the plant system.

5.3.4 Operation Phase

[41.V345-008i0055-R] PBS 45 shall provide services to connect other plant system I&C with CBS MAG.V3PS for monitoring and/or control.

5.3.5 Decommissioning Phase

TBD

5.4 IP-41.V3-45-07: Software Interface

Software interface with PBS 45 contains software environment interfaces, configuration interfaces and application program interfaces.

CODAC provides an I&C Integration Kit [RD2] dedicated to CBS MAG.V3PS. The I&C integration kit contains a preconfigured CODAC Core System (CCS), which facilitates the management and implementation of the entire configuration cycle required for the plant system construction.

[41.V345-008i0056-R] CODAC shall provide:

- CODAC Core System and required tools for PS I&C configuration.
- Interface drivers with ITER specified hardware components.
- Project creation in SVN.
- Central SDD repository.
- ITER specific common symbol library for GUI in Control System Studio (CSS).

[41.V345-008i0057-R] Plant system CBS MAG.V3PS developer shall provide:

- Set-up integration kit, as detailed in [RD2].
- Configure Self-Description Data (SDD).
- Develop Plant system I&C application program as per related PCDH satellite guidelines documents.
- Develop GUI in CSS - part of CODAC Core System (CCS).
- Synchronize data with SDD

[41.V345-008i0058-R] Source code shall be uploaded to ITER SVN / GIT. All information and tools required to compile or produce an executable software artefact shall be provided[9].

[41.V345-008i0059-R] Slow Controller application software shall be developed according to rules and guideline of ITER PLC Software Engineering Handbook [RD9].

All the software development procedures are described in the “CODAC Core System Application Development Manual” [RD4].

6 Interface Data

6.1 Central I&C network connections

Information related to interfacing CU is included in [AD5], all information related to CU physical location (GBS, coordinates, etc..) is to be taken from [AD6]

Assumptions:

[9] It is assumed that the executable SW artefact can be produced with the archived source code using the ITER toolchain. If this is not the case, separate measures have to be defined and described. In case the IP should not be available, the executable SW artefact shall to be uploaded, in this case a Deviation Request – DR is required.

- All access to CODAC networks is assumed to be centrally possible with one PBS41.V3 cubicle.
- TCN is required locally at the FPGA/local controller level. It is assumed that the TCN signal will be propagated to the FPGA/local controllers optically if required. At a further planning stage more TCN interface points may be required.
- Cubicle monitoring is implemented with ITER Standard Cubicle Monitoring System[10], based on the standard ITER cubicle HW catalogue Siemens Simatic S7-1200 to meet PCDH requirement [R157]. It is assumed that one CMU controls all cubicles in the converter/inverter unit.

6.2 Controllers

The list of controllers are defined in IDS-41-45-007 [AD2]. This includes the controller I&C cubicle location and the network interfaces required. In case [AD2] is not unavailable yet, the list of controllers shall be defined in the table given below in due time.

Table 7: List of Controllers

Control unit name PPPPPP-TTT-NNNN	Function	Cubicle	GBS	PA	Network
TBD	TBD	TBD	TBD	TBD	TBD

6.3 Variables

The list of variables are defined in the following IDS [AD2]. This includes Functions, Variables, External Variables, COS-PSOS Mapping.

7 Interface Step Status (Achieved Maturity Level)

Table 8: IS Maturity Status

Interface Points	Conceptual Allocation	Preliminary Allocation	Refined Allocation	Final Allocation
IP-41.V3-45-01: PON Interface	x			
IP-41.V3-45-02: TCN Interface	x			
IP-41.V3-45-03: SDN Interface	x			
IP-41.V3-45-04: DAN Interface	x			
IP-41.V3-45-05: PLN Interface	x			
IP-41.V3-45-06: Functional Interface	x			
IP-41.V3-45-07: Software Interface	x			

__ooOoo__

[10]The SW is available to connect to PON and CODAC. The CMU can monitor up to 10 cubicles, provided the electrical sensor signals are connected to the PLC. See also RRF3NH and 4H5DW6