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**TECHNOLOGIES ENABLING AGILE
MANUFACTURING
(TEAM)
INTELLIGENT CLOSED LOOP PROCESSING**

Open Architecture Specification

Part 1: General Information

January 11, 1996

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Foreword

This draft document has been prepared by the Technologies Enabling Agile Manufacturing (TEAM) Intelligent Closed Loop Processing (ICLP) Application Programming Interface (API) working group. The TEAM API working group developed a specification that will consist of the following series of documents:

- Part 1: General Information
- Part 2: Module Capabilities
- Part 3: Module Specification Class Descriptions
- Part 4: Module Specification C++ Header Files

Part 1 includes a Life Cycle model that describes the steps and actions required to build a controller. The breadth of satisfying Plug-and-Play compatibility is extensive. Not all elements in the Life Cycle have been addressed. The focus of the effort has been on defining Application Programming Interfaces for certain modules routinely that the ICLP community wants to upgrade. The TEAM API effort discusses but does NOT attempt to specify procedures for such issues as:

- performance evaluation
- validation, verification
- resource profiling and environment

This specification is scalable for the system design, integration and programming for systems ranging from a single-axis device to a multi-arm robot. The TEAM API working group focus was programming requirements for precision machining. Applicability to other control environments may be possible but cannot be guaranteed.

Background

Most CNC, motion and discrete control applications incorporate proprietary control technologies that have associated problems: non-common interfaces, higher-integration costs, and specialized training. On the other hand, an open-architecture controller is built from multi-vendor, plug-compatible modules and component parts. The operation to build a controller from module components is multi-faceted and includes the following major elements:

- User defines “initial conditions” such as hardware, control devices, and computing platforms that in general constitute the application resources.
- Platform supplies system low-level services (e.g., file-management, etc.)
- Integrator connects selected modules together via standard integration and configuration techniques.
- Analysis checks compliance of modules to support user-specification of performance and timing requirements.
- Flexibility of modules provides default or minimal functionality where user has not selected any.
- Scalability of modules allows convenient methods of experimentation - to reconfigure modules quickly; and optionally, capture results in order to analyze the experimentation.

These operations form the basis for the open architecture requirements which are:

Open

Allows the integration of off-the-shelf hardware and software components into a controller infrastructure that supports a “de facto” standard environment.

Modular

Refers to the ability of controls users and system integrators to purchase and replace components of the controller without adversely affecting the rest of the controller nor requiring extended integration engineering effort, permitting “plug and play” of a limited number of components for selected controller functions.

Extendible

Refers to the ability of intelligent users and third parties to incrementally add functionality to a module without replacing it completely.

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