Foreword

The ISA88 committee has defined a batch standard series that provides terminology and a consistent set of concepts and models for batch manufacturing plants and batch control. These standards, however, were not defined in the context of Packaging machines, or machines that perform discrete operations. As the ISA-88 batch standards continue to evolve, the context of the standard models may be extended to include the entire plant, integrating the software definitions of batch, packaging, converting and warehousing. Currently, as noted in this report there is a need to begin consideration of the ISA-88 standards in the context of differing automated machinery.

This is an informative document. This document contains definitive implementation examples of definitions and models in order to establish a common presentation and high level software architecture or layout. **The terms and definitions used in this document are harmonized, as much as possible, with ISA-88; the document is not definitive in this respect.** The models used, and applied, in this document are an extension of the models presented in ISA-88 and are shown how they are applied to differing machine functionality. Discrete machine functionality is expressed graphically in several situations and described. The intent of this document is to propose specific implementation options and indicate a preference for a specific set of machine types.

Abstract

The “standard” method of programming discrete machines is generally considered to be solely dependent on the machine and the software engineer, or control systems programmer. This constant change offers little additional value and generally increases the total costs, from the designing and building of the process to operating and maintaining the system by the end user. This Technical Report on the implementation of ISA-88 in discrete machines breaks this paradigm and demonstrates how to apply the ISA-88 standard to discrete machine states and modes. The implementation of the standard will create a standard programming methodology as well as consistent method to install, communicate, operate, and maintain a piece of unit/machine. This Technical Report gives examples of general and specific machine state models and procedural methods. The report cites real control examples as implementations, and provides specific tag naming conventions; it also cites a number of common terms that are consistent with batch processing and ISA-88.

Key Words

State machine, state model, mode manager, machine state, unit control mode, PackML, state commands, command tags, status tags, administration tags, base state model, state engine, functional programming, modular programming, machine control software, discrete machine software, PackTags, Weihenstephan, Production Data Acquisition, PDA, ISA88, and TR88.

Copyright 2008 ISA. All rights reserved.

Introduction

When the ISA-88 standard is applied to applications across a plant, there is a need to align the terminologies, models, and key definitions between different process types; continuous, batch, and discrete processes. Discrete processes involve machines found in the packaging, converting, and material handling applications. The operation of these machines is typically defined by the OEM, system integrator, end user, or is industry specific.

A task group with members from technology providers, OEMs, system integrators, and end users was chartered by the OMAC (Open Modular Architecture Control)/ISA Packaging Workgroup. The task group generated the PackML guidelines as a method to show how the ISA-88 concepts could be extended into packaging machinery. This technical report is intended to build upon and formalize the concepts of the PackML guidelines and to show application examples.

The purpose of the technical report is to

a) Explain functional state programming for automated machines;

b) Identify definitions for common terminology;

c) Explain to practitioners how to use state programming for automated machines;

d) Provide actual implementation examples and templates from automation control vendors;

e) Identify a common tag structure for automated machines in order to:

   1) Provide for Connect & Pack functionality;

   2) Provide functional interoperability and a consistent look and feel across the plant floor;

   3) Provide consistent tag structure for connection to plant MES and enterprise systems.

Copyright 2008 ISA. All rights reserved.