

**PACKAGE ID** - 001074MLTPL01 PRODIAG V 3.0

**KWIC TITLE** - Process Diagnosis Expert System Using First Principles and Functional Component

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**LIMITATION CODE** -COPY                   **AUDIENCE CODE** - LIM

**COMPLETION DATE** - 09/01/1997   **PUBLICATION DATE** - 09/01/1995

**DESCRIPTION** - PRODIAG is an expert system that performs online diagnosis of faulty components in thermal hydraulic processes. Given measurements of temperatures, pressure, flows, and liquid levels, PRODIAG identifies the possible faulty component candidates at the process level. It is a stand alone code, but can be used in conjunction with a component level program to distinguish among the possible faulty component candidates.

**PACKAGE CONTENTS** - Media Directory; Software Abstract; PRODIAG Theory; PRODIAG Code Manual; Media Includes Source Code;

**SOURCE CODE INCLUDED?** - Yes

**MEDIA QUANTITY** - 1 3.5 Diskette

**METHOD OF SOLUTION** - PRODIAG is composed of three knowledge bases and an inference engine. The first knowledge base contains first principles rules based on conservation equations and is used to characterize mass, momentum, and energy imbalances in the process components. The second knowledge base contains a library of components and their associated functional classification. The third consists of the structural information from the process schematics. The inference engine controls the flow of information and combines the input data with the three knowledge bases to infer the possible faulty components.

**COMPUTER** - MLT-PLTFM

**OPERATING SYSTEMS** - AIX, Domain/OS, Unix SVR4, CLIX, SunOS, Solaris, OS/MP, and VAX/VMS.

**PROGRAMMING LANGUAGES** - Prolog (Quintus Prolog release 3.2)

**SOFTWARE LIMITATIONS** - Limitations due to the version of Prolog used are both platform and problem dependent. The version of Prolog used automatically expands its space up to the total amount of virtual space permitted. Quite large problems can be executed with Prolog data areas of 2,000 Kbytes.

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**SOFTWARE LIMITATIONS - (CONT)**

**SOURCE CODE AVAILABLE (Y/N)** - Y

**UNIQUE FEATURES** - The first and second knowledge bases based on physical principles of conservation, are both general and process independent. They can thus be used for diagnosis of different processes. The third knowledge base, representing the process schematics. Is the only process dependent information and can be modified easily to represent different processes. This use of physical principles and the decoupling of the process independent and process dependent information provides for the formation of knowledge bases that can be verified and validated, are compact, and meet the real time requirements of online process diagnosis.

**RELATED SOFTWARE** - Version 3.0 of PRODIAG supercedes the original version (version 2.0). The interactive program, DIAGRAM, written in Quintus Prolog, is used to construct the third knowledge base representing the structural information associated with the process components.

**OTHER PROG/OPER SYS INFO** - PRODIAG is written in the proprietary Quintus Prolog language from Quintus Corporation, Mountain View, CA.

**HARDWARE REQS** - The platforms listed in item 6 above are supported by Quintus Prolog and are sufficient for full utilization of the PRODIAG software.

**TIME REQUIREMENTS** - PRODIAG is intended to run in or slightly slower than real time.

**REFERENCES** - Commonwealth Research Corporation/Argonne National Laboratory CRADA Report, Vol.1 PRODIAG Theory and Vol.2, PRODIAG CODE MANUAL, September 1995.

**ABSTRACT STATUS** - Released AS-IS 12/29/1998

**SUBJECT CLASS CODE** - T

**KEYWORDS -**

COMPUTER PROGRAM DOCUMENTATION  
P CODES  
ACCIDENTS  
DIAGNOSTIC TECHNIQUES  
NUCLEAR ENGINEERING  
ON-LINE SYSTEMS  
POWER PLANTS  
PROLOG  
REACTOR ACCIDENTS  
REACTOR COMPONENTS  
REACTOR MONITORING SYSTEMS

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REACTOR OPERATION  
REACTOR SAFETY  
REAL TIME SYSTEMS  
SYSTEM FAILURE ANALYSIS

**EDB SUBJECT CATEGORIES** -  
990200

**SPONSOR** - DOE/ER

**PACKAGE TYPE** - AS - IS