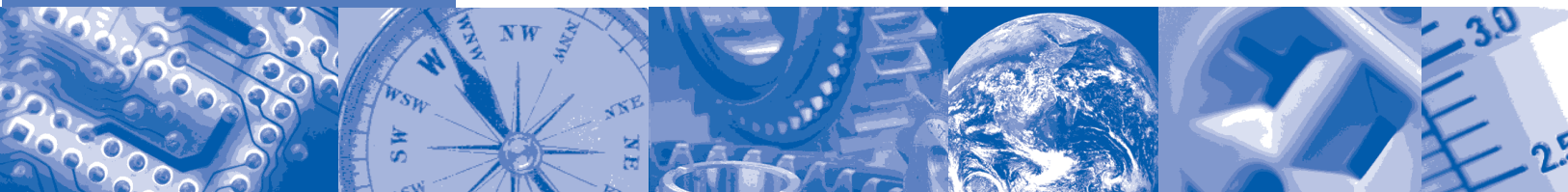


ISA-TR77.60.04-1996 (R2004)



Fossil Fuel Power Plant Human-Machine Interface – CRT Displays



ISA–The Instrumentation,
Systems, and
Automation Society

Reaffirmed 26 February 2004



Documents

Document Sharing Hub

ISA–TR77.60.04–1996 (R2004)
Fossil Fuel Power Plant Human-Machine Interface – Electronic Screen Displays

ISBN: 1-55617-609-0

Copyright © 1996 by the Instrument Society of America. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), without the prior written permission of the publisher.

ISA
67 Alexander Drive
P.O. Box 12277
Research Triangle Park, North Carolina 27709

.....

Preface

This preface, as well as all footnotes and annexes, is included for informational purposes only and is not part of ISA-TR77.60.04-1996 (R2004). The purpose of this Technical Report is to provide advice and guidance in the development of Electronic Screen Displays for use in conjunction with real-time Distributed Control Systems used in utility fossil-fired power plants with boilers of 200,000 lb/hr or greater capacity.

This Technical Report has been prepared as part of the service of ISA, the international society for measurement and control, toward a goal of uniformity in the field of instrumentation. To be of real value, this document should not be static but should be subject to periodic review. Toward this end, the Society welcomes all comments and criticisms and asks that they be addressed to the Secretary, Standards and Practices Board; ISA; 67 Alexander Drive; P.O. Box 12277; Research Triangle Park, NC 27709; Telephone (919) 549-8411; Fax (919) 549-8288; e-mail: standards@isa.org.

The ISA Standards and Practices Department is aware of the growing need for attention to the metric system of units in general, and the International System of Units (SI) in particular, in the preparation of instrumentation standards, recommended practices, and technical reports. The Department is further aware of the benefits to USA users of ISA standards of incorporating suitable references to the SI (and the metric system) in their business and professional dealings with other countries. Toward this end, this Department will endeavor to introduce SI and acceptable metric units as optional alternatives to English units in all new and revised standards to the greatest extent possible. The *Metric Practice Guide*, which has been published by the Institute of Electrical and Electronics Engineers as ANSI/IEEE Std. 268-1992, and future revisions will be the reference guide for definitions, symbols, abbreviations, and conversion factors. SI (metric) conversions in this Technical Report are given only to the precision intended in selecting the original numerical value.

It is the policy of ISA to encourage and welcome the participation of all concerned individuals and interests in the development of ISA standards, recommended practices, and technical reports. Participation in the ISA standards-making process by an individual in no way constitutes endorsement by the employer of that individual, of ISA, or of any of the standards that ISA develops.

CAUTION — ISA ADHERES TO THE POLICY OF THE AMERICAN NATIONAL STANDARDS INSTITUTE WITH REGARD TO PATENTS. IF ISA IS INFORMED OF AN EXISTING PATENT THAT IS REQUIRED FOR USE OF THE STANDARD, IT WILL REQUIRE THE OWNER OF THE PATENT TO EITHER GRANT A ROYALTY-FREE LICENSE FOR USE OF THE PATENT BY USERS COMPLYING WITH THE STANDARD OR A LICENSE ON REASONABLE TERMS AND CONDITIONS THAT ARE FREE FROM UNFAIR DISCRIMINATION.

EVEN IF ISA IS UNAWARE OF ANY PATENT COVERING THIS STANDARD, THE USER IS CAUTIONED THAT IMPLEMENTATION OF THE STANDARD MAY REQUIRE USE OF TECHNIQUES, PROCESSES, OR MATERIALS COVERED BY PATENT RIGHTS. ISA TAKES NO POSITION ON THE EXISTENCE OR VALIDITY OF ANY PATENT RIGHTS THAT MAY BE INVOLVED IN IMPLEMENTING THE STANDARD. ISA IS NOT RESPONSIBLE FOR IDENTIFYING ALL PATENTS THAT MAY

REQUIRE A LICENSE BEFORE IMPLEMENTATION OF THE STANDARD OR FOR INVESTIGATING THE VALIDITY OR SCOPE OF ANY PATENTS BROUGHT TO ITS ATTENTION. THE USER SHOULD CAREFULLY INVESTIGATE RELEVANT PATENTS BEFORE USING THE STANDARD FOR THE USER'S INTENDED APPLICATION.

HOWEVER, ISA ASKS THAT ANYONE REVIEWING THIS STANDARD WHO IS AWARE OF ANY PATENTS THAT MAY IMPACT IMPLEMENTATION OF THE STANDARD NOTIFY THE ISA STANDARDS AND PRACTICES DEPARTMENT OF THE PATENT AND ITS OWNER.

ADDITIONALLY, THE USE OF THIS STANDARD MAY INVOLVE HAZARDOUS MATERIALS, OPERATIONS OR EQUIPMENT. THE STANDARD CANNOT ANTICIPATE ALL POSSIBLE APPLICATIONS OR ADDRESS ALL POSSIBLE SAFETY ISSUES ASSOCIATED WITH USE IN HAZARDOUS CONDITIONS. THE USER OF THIS STANDARD MUST EXERCISE SOUND PROFESSIONAL JUDGMENT CONCERNING ITS USE AND APPLICABILITY UNDER THE USER'S PARTICULAR CIRCUMSTANCES.

THE USER MUST ALSO CONSIDER THE APPLICABILITY OF ANY GOVERNMENTAL REGULATORY LIMITATIONS AND ESTABLISHED SAFETY AND HEALTH PRACTICES BEFORE IMPLEMENTING THIS STANDARD. THE USER OF THIS DOCUMENT SHOULD BE AWARE THAT THIS DOCUMENT MAY BE IMPACTED BY ELECTRONIC SECURITY ISSUES. THE COMMITTEE HAS NOT YET ADDRESSED THE POTENTIAL ISSUES IN THIS VERSION.

The following people served as members of ISA Subcommittee SP77.60 and approved the document in 1996:

NAME	COMPANY
D. Tennant, Chairman	Consultant
R. Hubby, Co-Chairman	Max Control Systems, Inc.
S. Alvarez	Compania de Inspeccion Mexicana
D. Bernfeld	Niagara Mohawk Power Corporation
T. Broyles	Stone & Webster, Inc.
J. Brummer	Metropolitan Edison
D. Crow	TU Electric
G. Davis	Duke Power Company
C. Fernandez	Comision Federal de Electricidad
H. Foreman	Brown & Root Power
D. Frey	Computer & Control Consultants
N. Gordeuk	MMI Environments, Inc.
D. Hamme	Gilbert Commonwealth, Inc.
H. Hopkins	Utility Products of Arizona
D. Lee	Bailey Controls Company
N. Lyche	Chevron Overseas Petroleum Technology Company
S. Mattix	Duke Power Company
G. McFarland	Honeywell Industrial Automation & Controls, Inc.
G. Mead	Honeywell, Inc.
R. Papilla	Southern California Edison
R. Paul	Southern Company Services
A. Radice	ENEL
L. Schroeder	Axiom Technology Corporation
G. Schulte	Detroit Edison Company
M. Skoncey	Duquesne Light Company

S. Stultz
P. Toigo
T. Toms
R. Waters

Baltimore Gas & Electric Company
Burns & McDonnell
Carolina Power & Light Company
U.S. Department of Energy

The following people served as members of ISA Committee SP77 and approved the document in 1996:

NAME	COMPANY
R. Johnson, Chairman	Sargent & Lundy
T. Russell, Co-Chairman	Honeywell, Inc.
E. Adamson	Stone & Webster Engineering Corporation
L. Altcheh	Israel Electric Company
S. Alvarez	Compania de Inspeccion Mexicana
J. Batug	Pennsylvania Power & Light Company
*W. Blazier	Sargent & Lundy
L. Broeker	Cinergy
J. Cartwright	Ohmart Corporation
*Q. Chou	Ontario Hydro
D. Christopher	Houston Lighting & Power Company
F. Cunningham	Swagelok Company
G. Davis	Duke Power Company
C. Fernandez	Comision Federal de Electricidad
D. Foreman	Brown & Root Power
R. Forman	Process Auto Technologies
M. Fryman	Illinois Power Company
K. Gabel	Centerior Energy
A. Gile	Potomac Electric Company
R. Hicks	Black & Veatch
W. Holland	Southern Company Services, Inc.
H. Hopkins	Utility Products of Arizona
R. Hubby	Max Control Systems, Inc.
*J. Kennard	Ontario Hydro
J. Kling	Black & Veatch
D. Lee	Bailey Controls Company
W. Matz	Forney Corporation
G. McFarland	Honeywell Industrial Automation and Controls, Inc.
G. Mookerjee	Detroit Edison Company
J. Moskal	ABB Combustion Engineering Systems
*J. Murphy	E. I. du Pont
T. New	Leeds & Northrop (Alabama)
*N. Obleton	Honeywell, Inc.
R. Papilla	Southern California Edison
*M. Perakis	EPRI
*J. Pickle	E. I. du Pont
G. Ramachandran	Cytec Industries, Inc.
L. Rawlings II	Babcock & Wilcox Company

D. Roney
R. Roop
J. Rutledge
A. Schager
C. Skidmore
J. Smith
T. Stevenson
*C. Taft
D. Tennant
B. Traylor
*J. Weiss
J. Wiley
B. Zasowski
T. Zikas
T. Zuvlis

Raytheon Engineers & Constructors, Inc.
Hoosier Energy, Inc.
Jacksonville Electric Authority
Consultant
Florida Power & Light Company
Westinghouse Electric Corporation
Baltimore Gas & Electric
EPRI I&C Center
Consultant
Sandwell, Inc.
Electric Power Research Institute
Public Service of Colorado
Schlumberger Industries
Parker-Hannifin Corporation
Woodward Governor Company

* One vote per company

The following people served as Voting members of ISA Committee SP77 and reaffirmed the document in 2004:

NAME

COMPANY

W. Holland, Chairman	Consultant
L. Altcheh	Israel Electric Corp.
S. Alvarez	Compania Inspeccion Mexicana
J. Batug	PPL Generation LLC
D. Christopher	Reliant Energy
G. Cohee	Applied Control Systems
D. Crow	TXU Energy
A. Gavrilos	ABB Turbine Automation
R. Hicks	Black & Veatch
W. Hocking	Consultant
R. Hubby	Consultant
R. Johnson	Retired
D. Lee	ABB Inc.
G. McFarland	Emerson Process Management
G. Mookerjee	Detroit Edison Co.
R. Papilla	Edison O&M Services
L. Rawlings	Palm Beach Resource Recover Corp.
D. Roney	Washington Group International
M. Skoncey	Reliant Energy
T. Stevenson	Constellation Energy
C. Taft	EPRI I&C Center
D. Younie	Wood Group
A. Zadiraka	Babcock & Wilcox



Documents
Document Sharing Hub

This Technical Report was approved for publication by the ISA Standards and Practices Board on May 24, 1996.

NAME	COMPANY
M. Widmeyer, Vice President	Washington Public Power Supply System
H. Baumann	H. D. Baumann, Inc.
D. Bishop	Chevron USA Production Company
P. Brett	Honeywell, Inc.
W. Calder III	Calder Enterprises
H. Dammeyer	Phoenix Industries, Inc.
R. Dieck	Pratt & Whitney
W. Holland	Southern Company Services, Inc.
A. Iverson	Lyondell Petrochemical Company
K. Lindner	Endress + Hauser GmbH + Company
T. McAvinew	Metro Wastewater Reclamation District
A. McCauley, Jr.	Chagrin Valley Controls, Inc.
G. McFarland	Honeywell Industrial Automation & Controls, Inc.
E. Montgomery	Fluor Daniel, Inc.
D. Rapley	Rapley Engineering Services
R. Reimer	Rockwell Automation A-B
J. Rennie	Factory Mutual Research Corporation
R. Webb	Pacific Gas & Electric Company
W. Weidman	Consultant
J. Weiss	Electric Power Research Institute
J. Whetstone	National Institute of Standards & Technology
H. Wiegler	Canus Corporation
C. Williams	Eastman Kodak Company
G. Wood	Graeme Wood Consulting
M. Zielinski	Fisher•Rosemount

The reaffirmed technical report was approved for publication by the ISA Standards and Practices Board on 26 February 2004.

NAME	COMPANY
V. Maggioli, Chairman	Feltronics Corp.
K. Bond	Consultant
D. Bishop	David N. Bishop, Consultant
D. Bouchard	Paprican
M. Cohen	Consultant
M. Coppler	Ametek, Inc.
B. Dumortier	Schneider Electric
W. Holland	Consultant
E. Icahan	ACES, Inc.
A. Iverson	Ivy Optiks

NAME

R. Jones	Dow Chemical Co.
A. McCauley, Jr.	T. McAviney & C Engineering, LLC
G. McFarland	Chagrin Valley Controls, Inc.
D. Rapley	Emerson Process Management
R. Reimer	Rapley Consulting Inc.
J. Rennie	Rockwell Automation
H. Sasajima	Factory Mutual Research Corp.
I. Verhappen	Yamatake Corp.
R. Webb	Syncrude Canada Ltd.
W. Weidman	Consultant
J. Weiss	Parsons Energy & Chemicals Group
M. Widmeyer	KEMA Consulting
R. Wiegler	Stanford Linear Accelerator Center
C. Williams	CANUS Corp.
M. Zielinski	Eastman Kodak Co.
	Emerson Process Management

j

Abstract

This report recognizes the substantial volumes of technical information already in existence on the topic of Electronic Screen Display development. The intention of this Report is to provide a practical summary overview of the important considerations that apply to the development of effective Electronic Screen Displays. It is hoped to be a handy reference to those design engineers and power-plant operators who are directly involved in display development.

Key words

Electronic Screen Displays, coding conventions, color coding, Electronic Screen Display alarm management, Electronic Screen Display control applications, Electronic Screen Display development, Electronic Screen Display elements, Electronic Screen Display organization, Electronic Screen Display status, Electronic Screen Display structure, Electronic Screen Display types, Electronic Screen Display replacement guidelines, display access, Distributed Control Systems (DCS)*, format standards, fossil fuel power plant, human-machine interface, navigation designs (standard), operator entry techniques, real-time DCS, shape coding, size coding, typical color conventions for black background, work station ergonomics.

***NOTE** - Distributed Control Systems are also referred to as Digital Control Systems.

Copyright The Instrumentation, Systems, and Automation Society

Contents

Abstract	7
Key words	7
1 Scope	11
2 Purpose	12
3 Display structure	12
4 Display access	13
5 Display types	14
6 Format standards	15
7 Display organization	16
8 Coding conventions	18
8.1 General coding principles.....	18
8.2 Color coding	18
8.3 Size coding	20
8.4 Shape coding	20
8.5 Highlighting.....	21
8.6 Location coding	21
8.7 Alphanumeric codes and abbreviations.....	21
9 Display elements	22
10 Operator entry techniques	24
11 Control applications	26
12 Alarm management	28
13 Work station ergonomics	29
14 Electronic Screen Display replacement guidelines	29
 Annexes	
A — References	31
B — Typical color conventions for black background	33

Copyright The Instrumentation, Systems, and Automation Society