

A detailed technical cutaway illustration of a locomotive, showing its internal mechanical and electrical components. The locomotive is oriented vertically, with the front at the top and the rear at the bottom. The cutaway reveals the engine, transmission, and various control systems. The background is a light, textured green.

NEXSYS
LOCOMOTIVE CONTROL

Maintenance
and
Service Manual

ZTR
Control Systems



Maintenance and Service Manual



Shakopee
8050 State Highway 101
Shakopee, Minnesota 55379
USA
Railway Sales: (952) 885-8122
Railway Fax: (952) 233-4375
E-mail: RailwaySales@ztr.com

London
955 Green Valley Road
London, Ontario N6N 1E4
Canada
Telephone: (519) 452-1233
Fax: (519) 452-7764

Service and Support
Telephone: (519) 452-1233
E-mail: Service@ztr.com

www.ztr.com
100010 Rev1 Feb04

LIMITED WARRANTY

ZTR Control Systems ("Seller") warrants that all equipment sold hereunder has been inspected and tested and found to meet its published specifications when shipped from Seller's plant. Seller warrants that said equipment will be free from defects in material and workmanship for a period of one year from the date of shipment; provided, however, that this warranty does not apply to normal deterioration of replaceable or renewable parts and components.

EXCEPT FOR THE WARRANTY EXPRESSLY SET FORTH IN THE PRECEDING SENTENCES, SELLER MAKES NO WARRANTY (EXCEPT AS TO TITLE), EXPRESS, IMPLIED, BY DESCRIPTION, BY SAMPLE OR OTHERWISE, AND IN PARTICULAR AND WITHOUT LIMITATION MAKES NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PURPOSE. No modifications are authorized in this warranty unless in writing and signed by the President or any Vice President of Seller.

REPAIR OR REPLACEMENT EXCLUSIVE REMEDY. If any item of equipment fails to conform with the provisions hereof, Buyer's sole and exclusive remedy is to return the non-conforming equipment for repair, replacement or, at Seller's option, refund, to Seller's factory, transportation charges pre-paid. If Seller confirms that such equipment is non-conforming, Seller will repair or replace the same, free of charge f.o.b. the Seller's plant, or at its option, Seller may refund or credit the purchase price paid for the non-conforming equipment. Seller's obligation hereunder is subject to the other terms and provisions hereof, and shall terminate no later than one year from the date of shipment of the equipment.

LIMITATION OF LIABILITY; NO CONSEQUENTIAL DAMAGES. Seller's liability, whether in contract, in tort, or otherwise arising in any way in connection with the equipment sold hereunder, the non-delivery of said equipment or in any other fashion in connection with the equipment or its sale (a) shall not include liability for any incidental or consequential damages, loss or expense, such as, but not limited to, loss of profits, loss from business interruption, loss of information, damage or injury to, or death of, persons or property, or other monetary loss and (b) in any event shall not exceed the amount paid for the equipment in connection with which the liability arises.

The data and illustrations found in this book are not binding. ZTR Control Systems reserves the right to modify its products in line with its policy of continuous product development. A notice of

change may be released for any modifications that may significantly affect the user.

The Software, Software Materials, and Printed Documents constitute proprietary property of ZTR and include trade secrets and confidential information of ZTR. Customer acknowledges that it acquires only the right to use the Software and Software Materials as permitted hereunder and does not acquire any ownership, right or title in or to the Software, the Software Materials or any Third Party Software.

The customer acknowledges that the information contained on the software, software materials and printed documents could be used to the detriment of ZTR and that the disclosure could cause irreparable harm to ZTR. Accordingly, the customer undertakes to treat confidentially all information and not to disclose it to any third party.

No part of this document may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission of ZTR Control

Publication:1000101

Copyright © 2001 ZTR Control Systems

NEXSYS, the NEXSYS logo, Ideas and the Ideas logo are trademarks of ZTR Control Systems. SmartStart and the SmartStart logo are registered trademarks of ZTR Control Systems. All other marks are the property of their respective owners.

After the expiration of the Warranty Period, a Technical Service contract can be signed to allow ongoing help through telephone or on-site service. Contact ZTR Customer Service for details.

Chapter 1: About this manual

Chapter 2: Welcome to NEXSYS

Chapter 3: NEXSYS components

How NEXSYS controls your locomotive 3-2

Two models 3-3

NEXSYS 3-3

NEXSYS II 3-4

Inside the control panel 3-5

Back planes, CPU, and I/O modules 3-5

Back plane 3-5

CPU 3-7

Slide switches 3-8

mem prot 3-8

ASCII/RTU/mem 3-8

LED indicators 3-9

Back-up battery 3-9

I/O modules 3-9

Discrete modules 3-10

Analog modules 3-10

Power supply 3-11

Terminal blocks 3-11

Low voltage transducers 3-12

24T voltage transducer (dynamic braking option) 3-12

Remote Excitation Control (optional) 3-13

Relay box 3-13

Terminal boards 3-14

Main control harnesses 3-14

External NEXSYS components 3-17

Communication port 3-17

Traction motor voltage transducer (VT) 3-17

Traction motor current transducer (CT) 3-18

Grid current transducer (optional)	3-19
Grid blower fan current transducer (optional)	3-19
SCR driver panel	3-20
SCR module (optional)	3-20
Battery Field Supply (BFS) module	3-20
Battery Field Isolator (BFI) assembly	3-21
Speed transducer	3-22
Governor pressure switches	3-22
Engine temperature sensor	3-23
Short-term overcurrent light	3-23
Other components	3-24
Resistors	3-24
Suppression devices	3-24
Keypad display (if applied)	3-25

Optional components 3-25

Cellular / satellite link (optional)	3-25
--------------------------------------	------

SmartStart components 3-26

Autostart switch bracket	3-26
Governor assist pump	3-27
Ambient temperature switch	3-28
EPD override valve	3-28
Water temperature switch	3-28
Battery charging current switch	3-29
Sirens	3-30
Parking / lighting enable button	3-30
Autostart indicator light	3-30
Trainline diode assembly (optional)	3-30
Brake cylinder pressure switch	3-31

Chapter 4: NEXSYS operation

Excitation control in power (motoring) mode 4-2

- Throttle response / rate control and horsepower limiting 4-3
- Governor / engine status 4-4
- Main generator voltage and current limiting 4-4
- Traction motor current limiting 4-5
- Wheel slip / wheel creep detection and control 4-6
- Transition control 4-6
- Slipped pinion detection and annunciation (optional) 4-6

Excitation control during dynamic braking (optional) 4-7

- Traction motors field current control 4-7
- Grid current limiting 4-7
 - Excitation lockout in DB 4-7
- Wheel slide detection and control 4-8
- Main generator voltage limiting 4-8
- Grid blower motor failure detection (optional) 4-8
- Extended range DB control (optional) 4-8

Excitation control in self-load test (optional) 4-9

Additional locomotive control features 4-9

- Ground relay auto reset and lockout (optional) 4-10
- Engine temperature control (optional) 4-11
- Remote excitation control (optional) 4-11
- Data logging and fault annunciation (optional) 4-12
 - KWH recording 4-12
 - Throttle 8 low HP logger 4-12
 - GR Logger (optional) 4-13
 - Fault logger 4-13

Chapter 5: SmartStart operation

Shutdown 5-2

- SmartStart shutdown 5-2
 - Shutdown sequence 5-2
 - Shutdown mode 5-3
 - Locomotives equipped with the load-shedding option 5-3
- Other shutdowns 5-4
 - Protective device shutdown 5-4
 - Manual shutdown by crew 5-4

Restart 5-4

- SmartStart Restart 5-5
 - Step 1 5-5
 - Step 2 5-5
 - Restart sequence 5-6
 - Engine idling mode 5-6
- Crew initiated restart 5-7
 - Locomotive reverser 5-7
 - Restart using locomotive Prime/Start switch 5-7

Auxiliary load shedding & shutdown time delay override 5-7

- Auxiliary load shedding 5-7
- Shutdown time delay override: (when engine is running) 5-8

External system override 5-8

High idle control 5-8

Chapter 6: Keypad display

- Startup screen 6-2

Using the keypad display 6-4

- Turning ON the backlight 6-5

Troubleshoot NEXSYS using the keypad display 6-6

- Diagnostics 6-7



- Monitoring performance 6-7
- Viewing register values 6-8
- Viewing inputs and outputs 6-8
- Viewing fan status 6-8

Accessing SmartStart features (optional) 6-9

- Troubleshooting SmartStart using the keypad display 6-9
- Viewing system performance 6-10
- Viewing register values 6-10
- Viewing inputs and outputs 6-10

Chapter 7: Ideas PC Locomotive software

Installing Ideas on your PC 7-2

- Installing the Software 7-2
 - Ideas installation 7-3
 - Ideas Help 7-4
 - Software troubleshooting 7-4
- Starting Ideas 7-4
 - Log on to Ideas 7-4
- Setting admin. options 7-5
 - Modifying user settings 7-5
 - Adding or deleting a user 7-6
 - Changing security settings 7-6

Connecting your laptop to NEXSYS 7-6

Ideas overview 7-7

- Title screen 7-7
- Ideas sessions 7-10
 - Connected 7-10
 - Disconnected 7-10

Using Ideas commands 7-10

- Common commands 7-11
 - Program 7-11

Diagnostics 7-11

Reports 7-12

Monitor 7-12

Setup 7-12

Test 7-12

Common screen elements 7-12

Data window and push button 7-13

Dynamic text 7-13

Meter 7-13

LED indicators 7-14

Selector switch 7-14

Slide indicator 7-14

Ideas reports 7-15

Downloading records 7-16

Viewing reports 7-16

Sorting and filtering records 7-16

Sort by column heading 7-17

Filter by column information 7-17

Chapter 8: Maintenance

Recommended Maintenance Schedule 8-2

Every 92 Days 8-2

Annually 8-2

Every three Years 8-2

Every 9 Years 8-2

NEXSYS components 8-3

Qualify traction motor voltage transducer 8-3

Qualify traction motor current transducer 8-4

Replacing the current transducer 8-4

Qualify thermocouple transducer and thermocouple 8-6

Qualify frequency transducer 8-6

Qualify governor pressure switches 8-6

Replacing Governor Pressure Switches 8-7



- Qualify ambient temperature switch 8-8
 - Replacing the ambient temperature switch 8-8
- Qualify battery charging current switch 8-9
 - Replacing the battery charging current switch. 8-10
- Qualify brake cylinder pressure switch 8-10
 - Replacing the brake cylinder pressure switch 8-11
- Qualify governor assist pump 8-12
 - Replacing the governor assist pump, hoses and fittings 8-12
- Qualify NEXSYS back-up battery 8-14
- Replacing modules 8-14
- EPD override valve 8-16
 - Replacing the EPD override valve 8-18
- Qualify the water temperature switch 8-18
 - Replacing the water temperature switch 8-19
- Sirens 8-19
 - Replacing sirens 8-19
- Warning decals 8-20

Chapter 9: Troubleshooting

Using Ideas to troubleshoot 9-2

Verifying discrete I/O status during troubleshooting 9-2

Replace modules with faulty I/O 9-3

Identifying inputs and outputs 9-4

Interpreting Ideas messages 9-5

Discrete outputs 9-5

Discrete outputs 9-9

LED status during normal operation 9-14

Central Processing Unit 9-14

Digital Input / Output Module (WSC-221) 9-15

Analog Input Module (ADU-206) 9-15

Analog Output Module (DAU-202) 9-16

Chapter 10: Ordering replacement parts

Returning parts to ZTR Control Systems 10-2

After the part has been received 10-2

ZTR Control Systems RMA Policy 10-3

Description 10-3

Contact 10-3

Forms 10-4

Costs 10-4

Shipping 10-5

NEXSYS parts (by category) 10-6

Appendix A

