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Founded by Allen-Bradley, this project methodology is a process that is designed to ensure customer satisfaction. Matrix Automation is a Rockwell Automation/Allen-Bradley authorized system integrator.

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## Automation Plan



### Phase 1: Automation Plan

- Existing system operating procedures
- Highest potential automation areas
- Hardware/software block diagrams
- Field Hardware and sensor requirements
- Operational documents requirements
- System implementation plan and schedule
- System development, integration, assembly and testing requirements

- Phased pricing summary
- Return on investment analysis

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## PROJECT KICK-OFF MEETING



### Phase 2: Project Kick-Off Meeting

- Review scope of work and clarify integrator and client responsibilities
- Establish a mail and transmittal system
- Set up a drawing list
- Obtain a set of safety requirements
- Obtain reference drawings and data
- Establish project reporting methods
- Introduce key integrator and client personnel with overall project responsibilities
- Develop a preliminary outline for format of final report
- Establish deliverables

(Also, weekly project meetings attended by all system integrator personnel on project and monthly status review meetings.)

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## FIELD SURVEY



### Phase 3: Field Survey

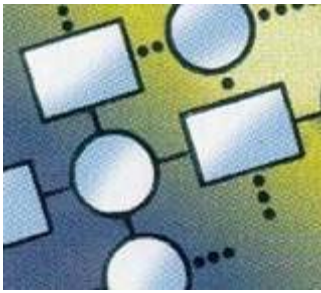
Integrator project team reviews current system, including:

- Physical layout
- Screen and report requirements
- Man machine interface
- Sequence of operation
- Current process overview

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## FUNCTIONAL DESCRIPTION



#### Phase 4: Functional Description

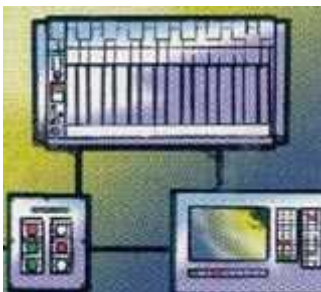
(States functional requirements for project.)

- Reference request for proposal
- Involves customer input
- Upon final client approval is basis for design document
- I/O list
  1. Machine identifier
  2. Rack identifier
  3. Input card identifier
  4. Signal type
  5. Terminal numbers
  6. Signal identifier

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#### DETAILED DESCRIPTION



#### Phase 5: Detailed Description

(Provides implementation method for each requirement in the functional description.)

- Controls, regulates and directs progress of system development
- Measures technical conformance
- Maintains project schedule
- Delineates internal structure of system (i.e., data dictionaries, flow charts, logic pseudo code)
- Client reviews design progress on regular

basis and must approve final document  
before project can proceed

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#### ACCEPTANCE TEST PLAN & PROCEDURES



#### **Phase 6: Acceptance Test Plan & Procedure**

(Developed after approval of Phase 4, Functional Description. This document explains how to test hardware and software to demonstrate conformance to system specifications. A detailed list of actions and expected results that satisfy all requirements.)

Test No. 1: Factory Acceptance Test (at S.I... facility)

- Complete system staging
- Comprehensive test to demonstrate all hardware and software for the project

Test No. 2: Field Acceptance Test (after system installation)

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## SYSTEM DEVELOPMENT



### Phase 7: System Development

#### Software Design

- Write software specifications per the Functional Description. Specifications will consist of data flow diagrams, block schematics (for PLC programming), data dictionary and mini-space (an English language description of the software functions). The specifications will provide enough information for a software engineer to write programming specifications.
- Software specifications must be reviewed and approved by client before coding is started. Any changes after client review will be regarded as major additions to the contract.
- Programming specifications will be pseudo code version of the final program, specific to operating system, language and hardware.
- Review of programming specifications will be made prior to final code and implementation.
- Graphics configuration: Application of control and feedback features to the screens as defined in the Functional Description.
- Coding of controls according to the software and program specifications.

#### Hardware Design

- Verification of existing customer drawings against actual field conditions.
- Develop demolition drawings to show sequence and conditions applicable to the removal of existing equipment.
- Develop system schematics showing terminal numbering, equipment type, etc.
- Develop diagrams to show wiring installation, terminal connections, conduit routing and cable type, etc. These will normally be done according to customer's standard cable schedule format.
- Develop diagrams for the necessary enclosures and panels for equipment mounting. Drawings will be suitable for bidding and construction by a third party supplier.
- Specifications to inform the vendor of the requirements necessary in the manufacture of the panels, i.e. type of enclosure (NEMA 4, etc.), weld instructions, finish, materials, etc.
- Release panel drawings for bid, or according to the procedure for the project (preferred vendor, etc.), and manufacture.
- Designate delivery time of panels and enclosures.

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SYSTEM INTEGRATION TASK



### Phase 8: System Integration Task

- After completion of software development and hardware/software interfaces, system hardware and software are integrated.
- During integration, power is applied to all hardware and burn-in program operates for 100 hours.
- Purchased hardware and all system peripherals are inspected and tested to verify that all software and hardware function according to manufacturers' specifications.
- Hardware and software are functionally tested and software is modified, as necessary, to assure software modules and hardware elements function as one system.

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### FACTORY ACCEPTANCE TEST



### Phase 9: Factory Acceptance Test

- Performed at system integrator test facility.
- Complete system staged and comprehensive mock-up test performed to demonstrate all hardware and software.
- Daily review of scheduled tests and test



- results.
- If necessary, integrator engineers correct any errors discovered and perform regression tests to show correct system performance.
  - Client and integrator jointly develop a "punch" list of items, if any, which require further action and/or correction before shipment.

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## SUPPORT SERVICE



### Phase 10: Support Services

#### Shipment

- Client must approve Factory Acceptance Test before shipment
- All equipment packed in manufacturers' packing boxes
- All items in shipment marked separately with shipping labels and clearly marked with special handling instructions
- Industry standard shipping materials and methods utilized to avoid damage to fragile items
- Proper shipping papers and packing slips prepared
- Physical audit and inventory of all deliverables performed and data given to client before delivery

- Physical audit and inventory data repeated by integrator after shipment
- Shipment sent using commercial carriers approved in advance
- Close contact maintained with carrier to verify that shipment is received promptly and in good condition

#### Installation Supervision

- Integrator's field installation engineer(s) will supervise all installation by others and will have the following responsibilities:
- Documentation package interpretation, distribution and maintenance
- Liaison
- System testing prior to commissioning
- Assist in system training sessions
- Inspection
- Work closely with client to respect the schedules and other demands on client personnel during installation

#### Start-Up

- One integrator engineer will be designated to schedule and coordinate all start-up activities with client
- Engineer will work closely with client to respect schedules and other demands on client personnel during start-up
- Same engineers who were responsible for designing the system will be responsible for the system start-up

#### Field Acceptance Test

##### Training

##### Management Training Program

- Lecture seminar for executives and managers
- Present general features and functions of the system
- Techniques for effective management monitoring and control of the system
- Discuss possible future development of the system
- Answer participants' questions

### Computer Training Program

- For system managers and engineers
- Theory of system operation
- Hardware configuration/system components
- Software concepts and structure
- System interface and data communications
- System preventative maintenance

### Operator Training Program

- Combination lecture/seminars and hands-on training for dispatchers and supervisors
- Focused on individual job assignments

### Maintenance Training Program

- Combination lecture/seminars and hands-on training for supervisory and maintenance personnel
- Instructions on how to maintain, trouble-shoot and adjust system equipment

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DOCUMENTATION



## Phase 11: Documentation

- Complete set of manuals of all hardware and standard software products incorporated in the system.
- Operational documentation for normal use of the system.
- Start-up and maintenance documentation for recovery operations.
- Design documentation specifying overall system structure.

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