Power System Monitor/Controller (PSMC) AT&T ECS-6U Engineering and Installation

Contents

(continued)

Contents, continued

1. General

1.1 Purpose

This practice provides implementation details for the AT&T ECS-6U controller, including details for:

- Engineering.
- Ordering.
- Installation.

1.2 Filing Instructions and Supersedures

File this practice in numerical order in your GTE Telephone Operations practices set.

This practice supersedes and cancels:

- All policies, procedures, general instructions, letters, and memoranda which address this subject.
- Any document which provides information contrary to the information contained in this practice.

1.3 Responsibility

This practice was published by the GTE Telephone Operations Administrative Services Department. For more information about this practice, contact the GTE Telephone Operations Headquarters COE Engineering Department.

1.4 Disclaimer

This practice was prepared solely for the use of GTE Telephone Operations. It must be used only by its employees, customers, and end users when installing, operating, maintaining, and repairing GTE Telephone Operations' equipment, facilities, and services. Any other use of this practice is forbidden. The information contained in this practice may not be applicable in all circumstances and is subject to change without notice. By using this practice the user agrees that GTE Telephone Operations will have no liability (to the extent permitted by applicable law) for any consequential, incidental, special, or punitive damages that may result.

2. Overview

2.1 Introduction

This practice provides implementation details for the AT&T ECS-6U controller, including details for:

- Engineering.
- Ordering.
- Installation.

The ECS-6U is an intelligent power plant controller that provides a short-term solution and a long-term migration path to improved network reliability, as well as a reduction of operational costs through reduced call-outs.

The ECS-6U:

- Reduces maintenance dispatches by diagnosing failures.
- Automatically restores the plant to normal operation when recoverable faults occur.
- Provides:
  - Remote access to plant drain histories to minimize oversizing.
  - Real-time surveillance to NOCs.
  - Prepositioning for future alarm reporting as the NOC migrates to TL1.

NOTE: The future NOC interface requirement of X.25/TL1 is being based on the machine-to-machine language (TL1) that will be used by the AT&T TransVu II system.

A key benefit of the ECS-6U is its ability to restart rectifiers (if equipped with the feature) after a high voltage shutdown caused by lightning-induced transients on commercial AC power lines. It also introduces a change from present maintenance procedures regarding alarm reporting. Only critical alarms that require immediate attention, such as BD, must be considered major alarms that require a call-out.

The ECS-6U is part of the AT&T Lineage family of products, using the same circuit cards and user interface as the ECS modular power systems that are already in wide use throughout GTE. There are no new or special training requirements associated with the controller.

2.2 Definitions

The following chart defines the acronyms and abbreviations used in this practice.

Acronym or Abbreviation	Definition
ACF	AC Failure
BD	Battery [On] Discharge (Low Voltage)
BDFB	Battery Distribution Fusing Board
CDF	Combined Distributing Frame
CO	Central Office
COE	Central Office Equipment

(continued)

2.2 Definitions, continued

Acronym or Abbreviation	Definition
COEMOD	Central Off ice Equipment Modeling
COMER	Central Off ice Mechanized Equipment Record
CPMS	Capital Program Management System
ECS	Evolutionary Control System
EPDG	Equipment Power Distribution Grounding
FA	Fuse Alarm
FT	Federal Telecommunications
HRPD	High Ripple Pull Down
HV	High Voltage
LCA	Low Current Alarm
LV	Low Voltage
LVD	Low Voltage Disconnect
LVR	Low Voltage Reconnect
MAN	Manual
MB	-48V Main Battery
MCS	Microprocessor Controlled System
MJF	Major Fuse [Failure]
MNF	Minor Fuse [Failure]
MR	Material Requisition
mV	Millivolt
NOC	Network Operations Center
PAD	Packet Assembler/Disassembler
PAGES	Power And Grounding Equipment Schematic
PDU	Power Distribution Unit

(continued)

2.2 Definitions, continued

Acronym or Abbreviation	Definition
PDUF	Power Distribution Unit Frame
PMJA	Power Major- Audible
PMJE	Power Major – External
PMJV	Power Major -Visible
PMNA	Power. Minor -Audible
PMNE	Power Minor – External
PMNV	Power Minor-Visible
PSMC	Power System Monitor/Controller
RFA	Rectifier Failure Alarm
RMJ	Ring [Generator] Major
RMN	Ring [Generator] Minor
ROM	Read-Only Memory
SPA	Station Polling Address
TA	Thermal Alarm
TL	Transaction Language
TSR	Telecommunications Service Request
UPF	Unit Processor Failure (ECS microprocessor failure).
UPS	Uninterruptible Power Supply
WECO	Western Electric Company

2.3 References

The following chart provides sources of supplementary information relating to this practice. The documents could be required for performing certain tasks.

See...	**For information About...**
Practice 205-005-200	Installation and Maintenance of Batteries
Practice 795-805-071	Central Office Grounding Systems Engineering Applications
Practice 795-805-072	AC Service Grounding Engineering Applications
Practice 795-805-078	Engineering Guidelines for Grounding AT&T Equipment in GTE Facilities
167-790-045*	Lineage 2000 ECS-6U Product Manual
167-790-109*	Lineage 2000 ECS Controller Options
J85501E-1 *	Lineage 2000 ECS-6U Universal Rectifier Controller – Power Systems Specification
SD-83122-01*	Lineage 2000 ECS-6U Universal Rectifier Controller – Schematic Diagram
T-831 22-30”	Lineage 2000 ECS-6U Universal Rectifier Controller – Cabling Diagram
EDC-17005-002**	Engineering Configuration Document – Equipment Power Distribution and Grounding
E-SW-200-000-008**	Standard Assignments for Discrete Alarm Points
TA-NWT-001360†	Generic Requirements for Power Systems Messages at the OS/NE Interface

* Published by AT&T

** Published by GTE Engineering.

† Published by Bell Communications Research.

3. Alarm and Control Description

3.1 Alarm Explanations

The following chart explains AT&T ECS-6U alarms.

Alarm	Explanation
BD (Battery on Discharge [Low Voltage Alarm])	BD is a critical alarm condition. If the rectifier output is not sufficient to provide enough current to the load, the battery begins to discharge. The discharge: • Is detected by the controller by a drop in the plant bus voltage. • Can be caused by: – Rectifier failures. – Loss of commercial AC power. – Rectifier current overloads. **NOTE: BD is a major alarm.**
Selective High Voltage Shutdown	Plant high voltage conditions due to lightning-induced transients on the commercial AC power line or rectifier failures are detected by the controller. To prevent damage to the load, the controller immediately sends a signal to the offending rectifier(s) to shut down. If a single rectifier (equipped with load sharing) fails, causing its output current to increase, the controller shuts down only that rectifier. With non-load sharing rectifiers, the controller issues a command to shut down all of the rectifiers in the plant until the voltage decreases. After a shutdown, the controller attempts to restart the rectifier(s). **NOTE: Selective High Voltage Shutdown is a major alarm.**
Automatic Rectifier Restart	If the rectifier is equipped with this feature, a high voltage shutdown issued by the controller is followed after a delay by an automatic restart signal that stays in effect for four to six minute:. This duration is intended to prevent multiple shutdown/restart cycles during lightning storms. Rectifiers that have not shut down: • Are unaffected by the restart signal. • Continue to run normally.

(continued)

3.1
Alarm Explanations, continued

Alarm	Explanation
Proportional Load Sharing	Rectifiers equipped with this feature divide the load in proportion to the output current rectifier rating. When the outputs of two or more rectifiers are connected in parallel, a load-sharing connection is made between the load-sharing terminals of each rectifier. This is usually found as a wire multiple.
RFA	The rectifier provides an RFA with the: • Loss of AC power. • Activation of the high voltage shutdown circuit. • Activation of the filter fuse alarms. Relay contacts should be conditioned to send a ground when a failure occurs. NOTE: **Depending on the type of system, the RFA is either a major** or **minor alarm.**
TA	A rectifier equipped with this feature provides a TA with the loss of the cooling fan if the rectifier is equipped with nonconvection cooling. Relay contacts should be conditioned to send a ground when a failure occurs. **NOTE: The TA is:** • **A minor alarm.** • **Multipled to the RFA.**
LCA	A rectifier equipped with this feature provides an LCA when the output of the rectifier is less than ½ of 1% of the rated capacity. Relay contacts should be conditioned to send a ground when a failure occurs. **NOTE: The LCA is:** • **A minor alarm.** • **Multipled to the RFA.**
FA	A rectifier equipped with this feature provides an FA if any filter fuse blows because of an overcurrent condition. Relay contacts should be conditioned to send a ground when a failure occurs. **NOTE: The FA is:** • **A minor alarm.** • **Multipled to the RFA.**

(continued)

3.1 Alarm Explanations, continued

Alarm	Explanation
Major and Minor Fuse Alarms	The controller monitors fuses and/or circuit breakers. The existing power board fuse alarms will be reterminated to the ECS-6U for remote alarm reporting.
HV	If the output voltage increases above a preset value while the rectifier is delivering greater than 3% of the rated output current, the high voltage shutdown circuit activates. **NOTE: HV is a major alarm.**
HRPD	If the rectifier is equipped with this feature, HRPD activates when any one of the three input phases is missing while more than 50% of the full load is present. Relay contacts should be conditioned to send a ground when a failure-occurs. **NOTE: The HRPD alarm is multipled to the ACF.**
Manual On/Off	A rectifier equipped with this feature indicates whether it is turned on or off. Relay contacts should be conditioned to send a ground when the rectifier is manually turned on.
ACF	If the rectifier is equipped with this feature, relay contacts should be conditioned to send a ground during a commercial AC failure.
Equalize	Equalizing batteries is a method of accelerating the return of batteries to a full charge after an extended commercial AC outage. Rectifiers are usually conditioned to receive a ground to force them from the Float mode to the Equalize mode. **NOTE: Lead-Antimony batteries require periodic equalization to restore individual cells to a full charge.**

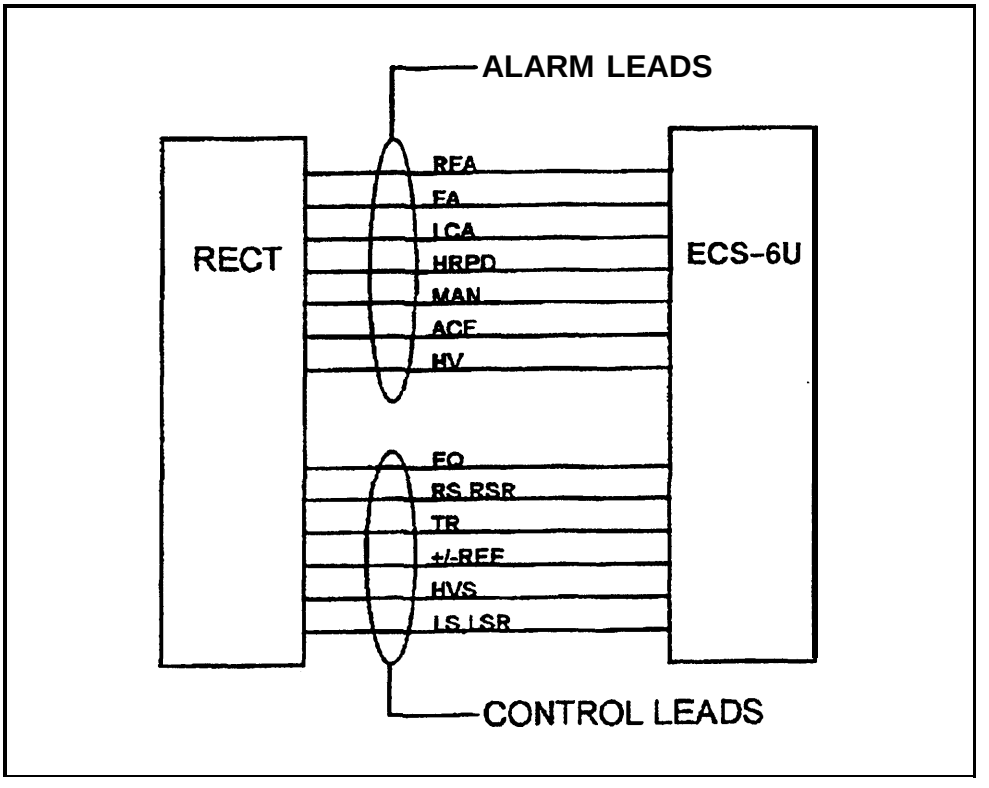
4. Description of the ECS-6U

4.1 Controller

The AT&T ECS-6U:

- Takes control of the power plant by monitoring:
  - Rectifiers.
  - Plant shunts.
- In order to minimize calf-outs, automatically attempts to restart rectifiers after recoverable faults occur.
- Permits rectifiers of various technologies, vintages, and vendors to be tied together in the same power plant.

The AT&T ECS-6U rectifier interface cables provide isolation of all control leads between rectifiers (see the following illustration).



All basic controller instructions are stored in ROM with DIP switch settings used to set system plant defaults. Equalization (if required) is under control of the microprocessor, which:

- Determines the extent of the commercial AC service interruption.
- To minimize the risk of overcharging, can provide equalization charges to the battery based on the outage duration.

Because the ECS-6U features a "Pass-Through" mode that enables the controller to communicate with other AT&T MCS and ECS controllers within 50 feet, only one telephone line per multicontroller site might be required.

4. Description of the ECS-6U, continued

4.2 Datalogger

The datalogger board (CP3) is an option that provides alarm and plant histories for 16 programmable analog or binary sense points that can be used for monitoring such auxiliary equipment found in larger COs as:

- System alarms (UPS, Inverter, 24V, ±130V).
- Battery pilot cell voltages.
- Distribution shunts.

4.3 Voice Response

The voice response option allows for access to plant functions:

- From a remote location.

  OR

- When a data terminal is not available.

The voice module is provided with the standard models under the deployment contract.

NOTE: The voice option has no control capabilities through the telephone.

5. Engineering of the ECS-6U

5.1 Ordering Configurations

The AT&T ECS-6U can be ordered as a basic model with or without a datalogger.

Order the ECS-6U...	In the Following Situations...
With a datalogger	If this is the initial installation.
Without a datalogger	In cases where additional controllers are required (e.g., power plants equipped with more than six rectifiers) unless additional datalogger ports are required.

5.1 Ordering Configurations, continued

The following tables give pertinent ordering information.

GTE ECS-6U Models- Order Controliers as Required			
GTE Code	**AT&T Comcode**	**Description**	**Price**
375766	GTE Model Comcode 601420532	ECS-6U Assembly (w/ mtg. adapt.) AKCl (Shunt Isolator) CP2 (Microprocessor Board), e/w voice, X.25/TL1 EAT2 (Rectifier Adapter Board) CP3 (Datalogger Board) Miscellaneous Wiring Kit	$4,800
375767	GTE Model Comcode 601420540	ECS-6U Assembly (w/ mtg. adapt.) AKC1 (Shunt Isolator) CP2 (Microprocessor Board), e/w voice, X.25/TL1 EAT2 (Rectifier Adapter Board) Miscellaneous Wiring and Inst. Kit	$3,305

Rectifier Interface Cable -Order One Cable per Rectifier			
GTE Code	**AT&T No./ Comcode**	**Description**	**Price**
353825	H-285-226, List 42	AT&T Switched Mode Rectifier	$19
353826	H-285-226, List 44	AT&T Lineage Rectifier (Ferro)	$19
375768	Comcode 847180312	Non-AT&T Rectifier – 50'	$16
	H-285-226, List 46	AT&T J87434 or J87435 (e/w SP3) Rectifier	$19
	H-285-226, List 47	AT&T J87434 or J87435 (e/w SPA), or J87436 through J87439 (e/w SPA) 24V Rectifier	$19
353828	H-285-226, List 48	AT&T J87434 or 587435 (e/w SPA), or J87436 through J87439 (e/w SPA) 48V Rectifier	$19
	H-285-226, List 49	AT&T J87436 through J87439 (e/w SPA) 24V Rectifier	$19
353829	H-285-226, List 50	AT&T J87436 through J87439 (e/w SPA) 48V Rectifier	$19

ECS-6U Accessories			
GTE Code	**Part No.**	**Description**	**Price**
	Comcode 845366772	AT&T Current Limiting Resistor Assembly (2/Sense Leads – Binary) (Included with GTE Models)	
353813	J8550E1, List E	CP3 (Datalogger Board)	$1,559

5.2 AT&T "E&F" National Contract

A national deployment contract (#120500-93-01) was negotiated between AT&T and GTE on an engineer and furnish basis for retrofit to existing power plants. This agreement requires that GTE purchase engineering services and AT&T ECS-6Us for 315 sites over a three-year period.

5.2.1 What GTE Enaineerina Will Provide

GTE will provide to AT&T:

- Existing site power records.
- The latest issue job drawings (EPDG, floor plan, CDF, etc.).
- Authorization for prefield visit when deemed necessary.

These will be forwarded (at one time under separate cover) for all sites that are scheduled for engineering during the calendar year. This will permit AT&T to gain engineering efficiency by scheduling its workload independent of the shipping schedule. GTE is responsible for creating the work order in CPMS.

NOTE: The ECS-6U work orders will not be combined with other projects.

5.2.2 What AT&T Engineering Services Will Provide

Under the terms of the agreement, AT&T will provide basic engineering of the ECS-6U to an existing power plant (single or multicontroller) for a fixed cost of $800.00. The contract engineering price includes:

1. CPMS work order preparation. The CPMS work order will include:
   - Material specifications.
   - Installer's notes.
   - The cable running iist.
2. COMER records.
3. Mounting of the controller in an existing frame. GTE will be billed for any additional racks, cable runway, and miscellaneous material (if required) that is not included in the GTE models. AT&T will ensure that racks-provided:
   - Are GTE standard.
   - Match the rack next to them.

   NOTE: If an AKC1 card is provided, it will require a 27-inch rack.
4. Shunt modification (if required). If an existing shunt is not compatible with the ECS-6U, the installer must notify the AT&T engineer for an AKC1 modification kit. There will be no additional charge for engineering, and GTE will be billed for material only. As part of the PAGES drawing, AT&T will provide installation notes on how to modify the shunt.
5. COEMOD-compatible PAGES drawing. AT&T will do drawing conversions of existing EPDGs for inclusion with the PAGES drawing for $60 per drawing plus $2 per sheet.
6. Ordering GTE model(s) for the ECS-6U, using the generic material codes for:
   - "1 -Lot" of AT&T equipment.
   - "1 -Lot" of AT&T engineering.

   The contract number will be shown in the MR fields.
7. Marked installation and engineering drawings for changes to floor plans, cable runways, relay racks, or other miscellaneous drawings.

5.2 AT&T "E&F" National Contract, continued

5.2.2 What AT&T Engineering Services Will Provide, continued

8. Forwarding of detailed drawings and equipment specifications to GTE four weeks before the Material Due Date shown in CPMS.

   NOTE: Occasionally, these dates might require negotiation if emergency requirements exist.

GTE Engineering will establish milestone dates in CPMS. This will allow:

- For:
  - The work order to be approved.
  - Supply to cut the purchase order to AT&T.
- AT&T to complete the detail engineering and get the prints and specifications to GTE four weeks before the Material Ship Date.

5.3 Frame Mounting

The AT&T ECS-6U:

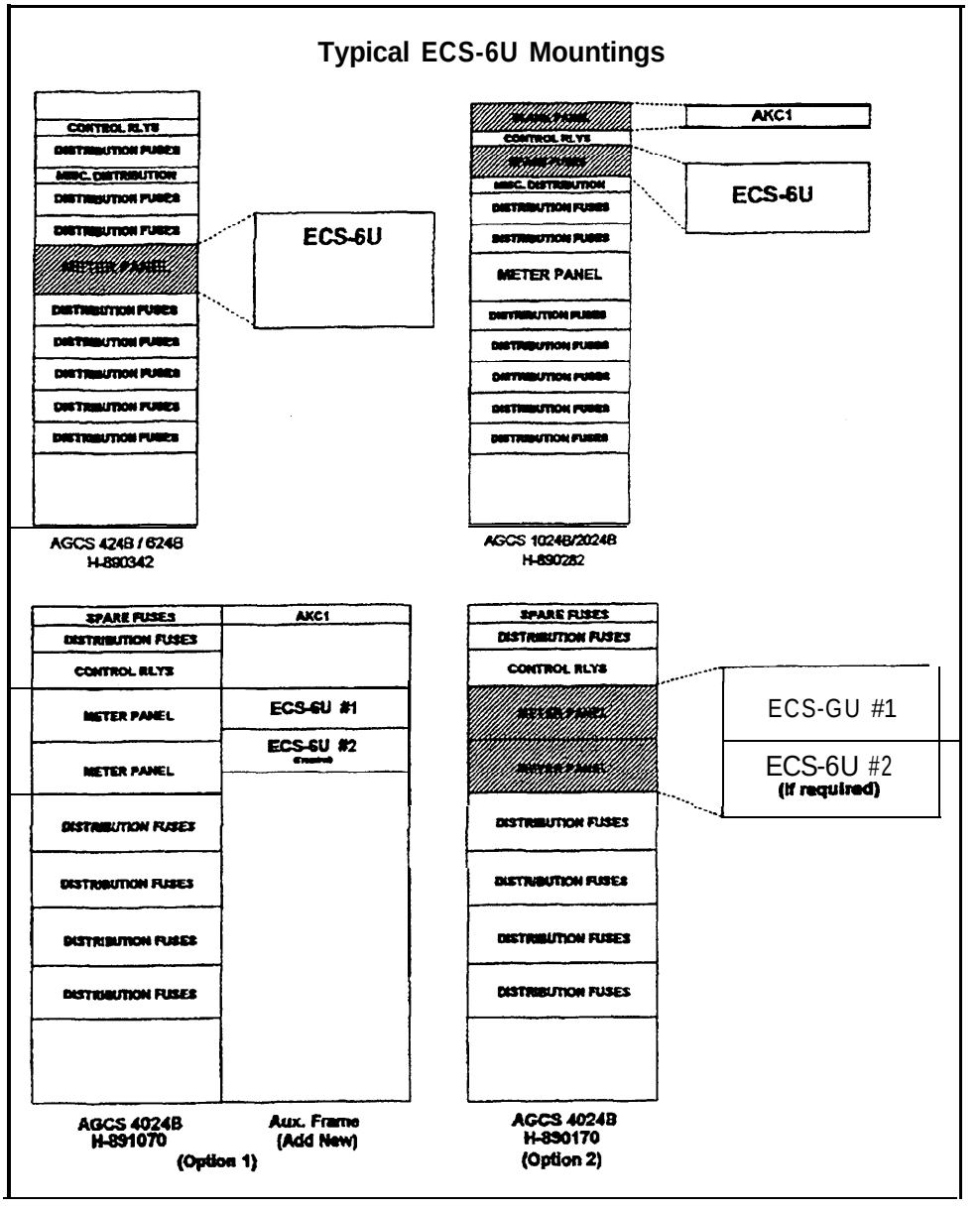
- is 7 inches high.
- Comes equipped with brackets for 23- and 27-inch mounting for installation convenience.

The following chart summarizes mounting requirements.

Mounting Requirement	Explanation
Location	If space is available, the controller should be mounted in or near the power board to simplify wiring. Alternate locations in the power area include: • Rectifier frames. • PDUFs. . BDFBs. • Miscellaneous power frames.
Mounting Height	Mounting height at eye level is desirable but not required.
Mounting Adapters	The installer must use the appropriate mounting adapters to match the installation. Any mounting adapters not required should be discarded. **NOTE: When mounting in 30-inch frames, additional adapters must be provided.**

5.3 Frame Mounting, continued

The following illustration shows typical ECS-6U mountings when located on existing racks.



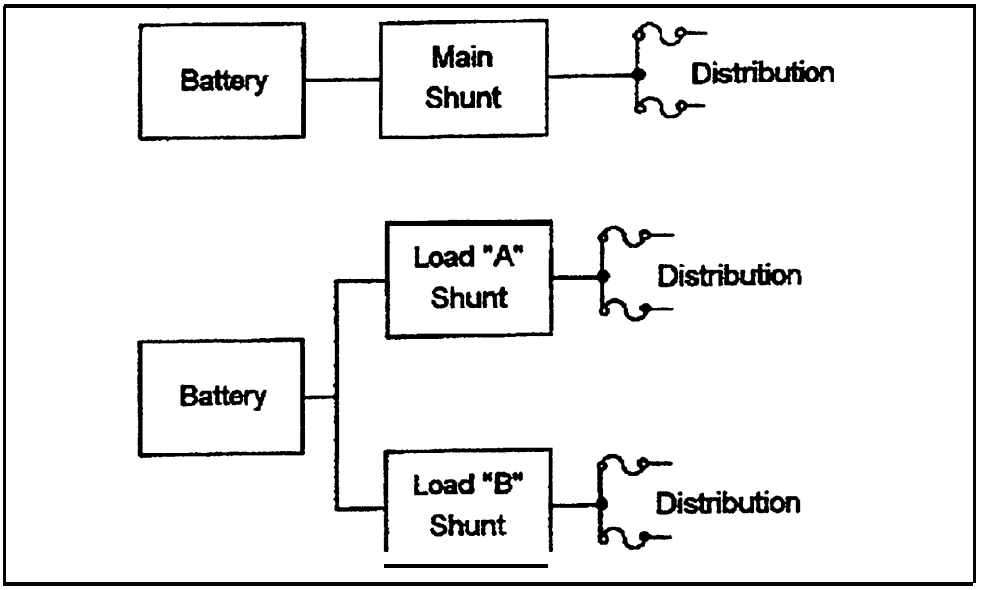
5.4 Shunt Requirements

A shunt isolator circuit (AKC1) is required for all negative shunt plants (i.e., if the main plant shunt is located on the battery (-) side, a shunt isolator circuit is required). Since this condition exists in most GTE power plants, you should assume that a shunt isolator circuit will be required unless the power board is an AT&T power board (not WECO).

AKC1 is always provided with the standard GTE models. If the AKC1 is not required and is unopened, return the AKC1 card and shelf for credit.

5.4 Shunt Requirements, continued

The following illustration shows some typical negative shunt configurations found in GTE. The interconnections in these plants can be rigid or nonrigid (cable) bus.



The power plant configuration must be known before the proper shunt modification kit can be provided. See Section 5.4.1 as necessary for shunt or wiring modifications.

5.4.1 Shunt/Wiring Modifications

AT&T Lineage power boards:

- Are equipped with a positive shunt located in the return (ground) lead.
- Do not require an isolator circuit.

The AT&T ECS-6U uses DIP switches to set the shunt parameters. If the power plant's shunt value is not shown in the following table, the AKC1 card must be modified to correspond to one of the values indicated.

NOTE: Although the shunt's value must be verified, most main shunts are 50 mV.

ECS-6U Shunt Options								
25 mV	150A	300A	600A	1000A	1300A	2000A	3000A	4000A
50 mV	300A	600A	1200A	2000A	2600A	4000A	6000A	8000A
100 mV	600A	N/A	2400A	4000A	5200A	8000A	N/A	N/A

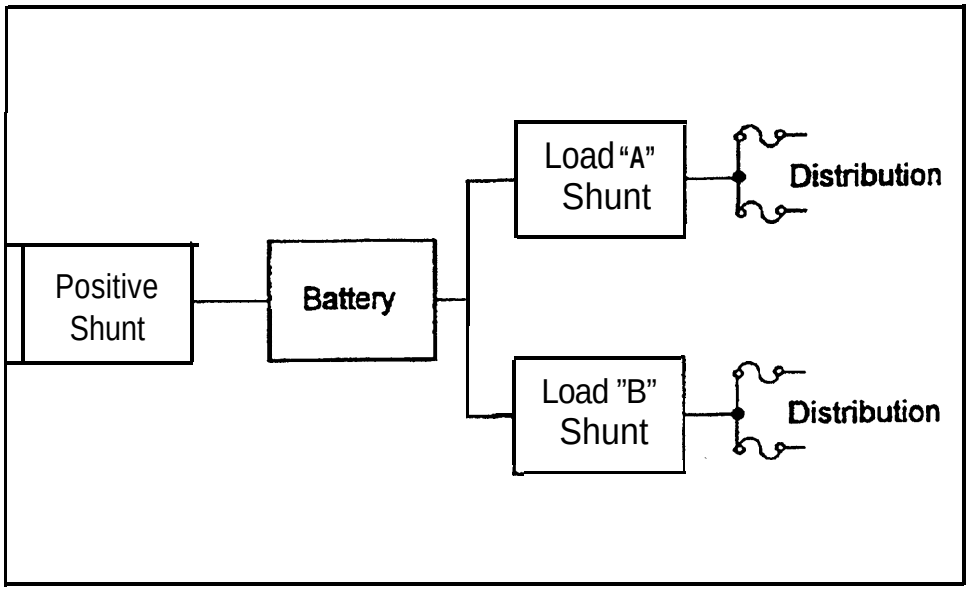
Negative shunt dual bus power boards can be converted to positive shunt plants by the addition of a new shunt between the positive battery and the power board. The AKC1 will not be used in this case.

Other power boards that do **not have** shunts in the indicated ranges require a shunt modification. This requires the insertion of a resistor on the AKC1 card. In these cases, the power board ammeter must be disabled to avoid inaccurate readings.

5.4 Shunt Requirements, continued

5.4.1 Shunt/Wiring Modifications, continued

The following illustration shows a typical plant modified to add a positive shunt.



5.5 Retrofit of Existing ECS Controllers with X.25/TL1

Existing ECS controllers must be upgraded with the TL1 features. As part of the AT&T negotiations for the ECS-6U deployment, AT&T has agreed to ship upgrade kits at no charge. To receive the upgrade kits:

1. Contact AT&T as follows:

   AT&T Network Systems
   Jim Weimer
   708/290-2503
2. Identify the site(s) or location(s).
3. Provide complete shipping information for the upgrade kits.

This upgrade places a new chip set in the microprocessor circuit board (CB2). All existing ECS controllers equipped with CP2 microcoded 80043A1 B through 80043A4B can accept the X.25/TL1 protocol chip set. Older versions (80043A1):

- Cannot accept the chip set.
- Will provide discrete alarms only.

5.6 Wiring Details

For wiring details, refer to the PAGES drawing or see Exhibit 3.

5.7 Isolation and Grounding

If the AT&T ECS-6U is mounted in an existing frame that uses an integrated mounting scheme, there are no special isolation or grounding requirements. Grounding and isolation should comply with the requirements in the following GTE Telephone Operations Practices:

- **795-805-071.**

.795-805-072.

. 795-805-078.

5. Engineering of the ECS-6U, continued

5.8 DIP Switch Settings

DIP switch settings are used for rectifier and controller default settings. Refer to the power equipment threshold values table in GTE Telephone Operations Practice 205-005-200.

6. Installation of the ECS-6U

6.1 Rectifier Interface Cabling

The AT&T ECS-6U will replace existing rectifier control and alarm wiring multiples; this replacement involves the removal of the wire multiples, including the reference (external remote sense) leads.

The rectifier alarm and control terminals will be cabled to the ECS-6U as required. (One interface cable is required per rectifier.) The actual number of leads in the cable depends on the rectifier. If there are more than six rectifiers, they can be multipled together in groups instead of using a second controller. This can be useful when monitoring rectifiers arranged in four- or eight-packs, where a number of smaller rectifiers are located in the same cabinet.

The following chart provides ECS-6U rectifier wire lead definitions.

ECS-6U	**Rectifier Wire Lead Definition**
+R	Positive voltage from the point of regulation- External Remote Sense.
-R	Negative voltage from the point of regulation – External Remote Sense.
ACFO	AC input failure- Ground sent to the controller from the rectifier. **NOTE: This can include phase loss alarms (HRPD).**
BAT	Alarm relay battery source- Battery sent to the rectifier from the controller.
EQO	Equalization-Ground sent to the rectifier from the controller.
HVO	High Voltage Shutdown from the controller- Ground sent to the rectifier from the controller.
HVRO	Ground (OV) -Ground sent to the controller from the rectifier.
MAN0	Rectifier turned off manually-Ground sent to the controller from the rectifier.

(continued)

6.1 Rectifier Interface Cabling, continued

ECS-6U	Rectifier Wire Lead Definition
RFAO	Rectifier Failure Alarm-Ground sent from the rectifier to the controller.
RS	Restart Signal-Ground sent from the controller to the rectifier.
RSR	Restart Signal Return- Ground sent from the rectifier to the controller.
TRHO	Rectifier shutdown handshake-Ground sent to the controller from the rectifier.
TRO	Remote rectifier shutdown from the controller-Ground sent to the rectifier from the controller.

6.2 Typical Termination of Non-AT&T Rectifiers

The following chart shows the rectifier cable between the AT&T ECS-6U and a Lorain RL200D50 rectifier.

NOTE: **Not all rectifiers have the same leads.**
Old rectifiers might have limited:
- **Alarm indicators.**
- **Limit controls.**

Pin	RL200D50	Definition	ECS-6U
1	+ REF	+ Remote Sense	+R
2	- REF	- Remote Sense	-R
3	- LS	Load Sharing	LS, LSR
6	RCC	Remote Charger Control	TRO
7	REM EQ	Remote Equalization	EQO
13	LCA	Low Current Alarm	RFAO
19	PL	Partial Load Current Load	
20	EXT HVS	High Voltage Shutdown	HVO
22	+ BAT	Ground (0V)	HVRO
23	RS (rtn)	Restart Signal Return	RSR
24	RS	Restart Signal	RS

(continued)

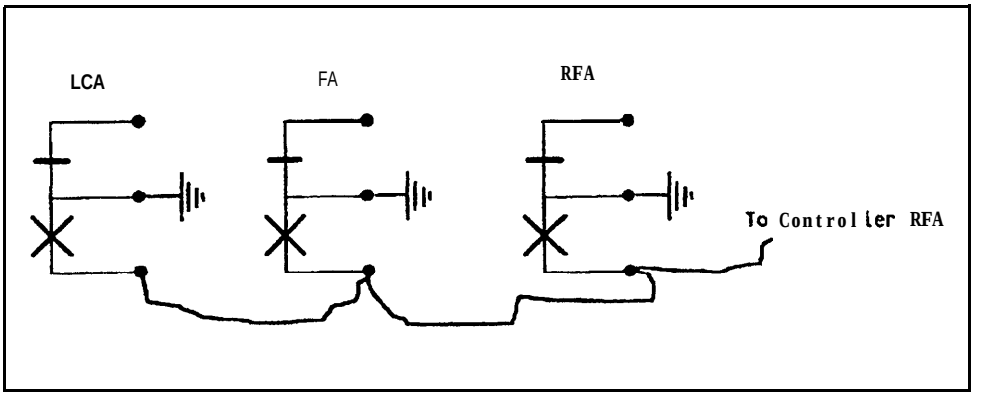
6.2 Typical Termination of Non-AT&T Rectifiers, continued

Pin	RL200D50	Definition	ECS-6U
27	RCC (grd)	RCC Handshake	TRHO
30	FA	Rectifier Fuse Alarm	RFAO
33	RFA	Rectifier Failure Alarm	RFAO
41	PWR ON	Power Turned On	
42	COM	Power Turned On/Off	
43	PWR OFF	Power Turned Off	MANO
46	HRPD	High Ripple Pull Down	ACFO

Multiple the various rectifier external alarm leads through their Form-C contacts to the RFA. Since the controller treats all RFAs as minor alarms, these can be multipled as required.

NOTE: Not all rectifiers are equipped with separate LCA and/or FA alarms. The instalier must verify rectifier wiring with the appropriate installation manual before proceeding with the installation.

The following illustration shows relays operated under an alarm condition.



6.3 Rectifier Cross-Reference Table and Termination Figures

Manufacturer	Model	Spec.	Fig.	Manufacturer	Model	Spec.	Fig.
ITT/North	PEC3616		9				
ITT/North	PEC3861		8				
ITT/North	PEC3862		8				
ITT/North	PEC3874		8				
ITT/North	PEC3874		8				
ITT/North	PEC3875		8				
Lorain	CM1600D50	5486003	2				
Lorain	CM1600D50	5487004	2				
Lorain	CM400D50		2				
Lorain	CM800D50	5484017	2				
Lorain	CM800D50	5484018	2				
Lorain	F400D50	5481013	1				
Lorain	RHM100C50	5457005	6				
Lorain	RHMIOOD50	5454010	3				
Lorain	RHM100D50	5454017	3				
Lorain	RHM200C50	5475010	6				
Lorain	RHM200D50	5472014	3				
Lorain	RHM200D50	5472019	3				
Lorain	RHM400C50	5482017	6				
Lorain	RHM400D50	5481038	3				
Lorain	RHM400D50	5481041	3				
Lorain	RHM800D50	5484033	3				
Lorain	RL100B50	5451032	5				
Lorain	RL100F50	5451033	4				
Lorain	RL100F50	5451034	4				
Lorain	RL200D50	5472021	7				
Lorain	RL200D50	5472022	7				
Lorain	RL200D50	5472023	7				
Lorain	RL50B50	5432025	5				
Warren			10				
Warren			11				

NOTE: **If during installation, you find rectifiers not listed in this table, FAX the model, specification number, and a wiring figure to Network Engineering at 214/718-7414. This table will be revised to help the next installer when he or she encounters a similar problem.**

6.3 Rectifier Cross-Reference Table and Termination Figures, continued

Rectifier Figure 1	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ REF	R+	Positive Voltage Regulation		
-REF	R-	Negative Voltage Regulation		
-48V	BAT	Alarm and Control Relay Battery		
RFA, FA	RFAO	Rectifier Failure Alarm		
-LS	LS, LSR	Load Sharing		

Rectifier Figure 2	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ REF	R+	Positive Voltage Regulation		
-REF	R-	Negative Voltage Regulation		
-48V	BAT	Alarm and Control Relay Battery		
RFA, FA, LCA	RFAO	Rectifier Failure Alarm		+
OFF	MAN0	Rectifier Manual OFF		
-LS	LS, LSR	Load Sharing		

Rectifier Figure 3	ECS-6U			
Alarm and Control Designation	Lead **Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ REF	R+	Positive Voltage Regulation		
-REF	R-	Negative Voltage Regulation		
REM EQ	EQO	Remote Equalization	+	
+ BAT	HVRO	Ground from Rectifier		+
RFA, LCA	RFAO	Rectifier Failure Alarm		+
PLA	ACFO	AC Input Failure		
-LS	LS, LSR	Load Sharing		

6.3 Rectifier Cross-Reference Table and Termination Figures, continued

Rectifier Figure 4	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ REF	R+	Positive Voltage Regulation		
-REF	R-	I Negative Voltage Regulation		
	RS	Rectifier Restart		
	RSR	Rectifier Restart Return		
REM EQ	EQO	Remote Equalization	+	
	HVO	High Voltage Shutdown	+	
+ BAT	HVRO	Ground from Rectifier		+
RFA, LCA	RFAO	Rectifier Failure Alarm		
-LS	LS, LSR	Load Sharing		

Rectifier Figure 5	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ REF	R+	Positive Voltage Regulation		
-REF	R-	Negative Voltage Regulation		
RS	RS	Rectifier Restart		
RS Rtn	RSR	Rectifier Restart Return		
RCC	TRO	Remote Turn OFF	+	
REMEQ	EQO	Remote Equalization	+	
HVS	HVO	High Voltage Shutdown	+	
+ BAT	HVRO	Ground from Rectifier		+
RCC Grd	TRHO	Remote Turn OFF- Handshake		+
RFA, FA, LCA	RFAO	Rectifier Failure Alarm		
-LS	LS, LSR	Load Sharing		

6.3 Rectifier Cross-Reference Table and Termination Figures, continued

Rectifier Figure 6	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ REF	R+	Positive Voltage Regulation		
-REF	R-	Negative Voltage Regulation		
REM EQ	EQO	Remote Equalization	+	
RFA	RFAO	Rectifier Failure Alarm		+
	MAN0	Rectifier Manual OFF		+
	ACFO	AC Input Failure		
-LS	LS, LSR	Load Sharing		

Rectifier Figure 7	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ REF	R+	Positive Voltage Regulation		
-REF	R-	Negative Voltage Regulation		
RS	RS	Rectifier Restart		
RS Rtn	RSR	Rectifier Restart Return		
RCC	TRO	Remote Turn OFF	+	
REM EQ	EQO	Remote Equalization	+	
HVS	HVO	High Voltage Shutdown	+	
+BAT	HVRO	Ground from Rectifier		+
RCC Rtn	TRHO	Remote Turn OFF- Handshake		+
RFA, FA, LCA	RFAO	Rectifier Failure Alarm		+
OFF	MAN0	Rectifier Manual OFF		+
HRPD	ACFO	AC Input Failure		
-LS	LS, LSR	Load Shanng		

Rectifier Figure 8	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ Sense	R+	Positive Voltage Regulation		
-Sense	R-	Negative Voltage Regulation		
RFA	RFAO	Rectifier Failure Alarm		
-LS	LS, LSR	Load Sharing		

6.3 Rectifier Cross-Reference Table and Termination Figures, continued

Rectifier Figure 9	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
+ Sense	R+	Positive Voltage Regulation		
-Sense	R-	Negative Voltage Regulation		
EQ	EQO	Remote Equalization	+	
RFA, FA, LCA	RFAO	Rectifier Failure Alarm		
-LS	LS, LSR	Load Sharing		

Rectifier Figure 10	ECS-6U			
Alarm and Control Designation	**Lead Designation**	**Signal Description**	**Signal Sent**	**Signal Rec'd**
	R+	Positive Voltage Regulation		
	R-	Negative Voltage Regulation		
	RS	Rectifier Restart		
	RSR	Rectifier Restart Return		
	BAT	Alarm and Control Relay Battery		
	TRO	Remote Turn OFF	+	
	EQO	Remote Equalization	+	
	HVO	High Voltage Shutdown	+	
	HVRO	Ground from Rectifier		+
	TRHO	Remote Turn OFF – Handshake	-	+
	RFAO	Rectifier Failure Alarm		+
	MAN0	Rectifier Manual OFF		+
	ACFO	AC Input Failure		
	LS, LSR	Load Sharing		

6.4 Connections from the ECS-6U to co Alarm Circuits

The AT&T ECS-6U will replace many, if not all, of the functions of the meter, control, and alarm panel that is typically equipped with the power board. The connection of the ECS power plant alarms to the CO alarm circuits is made at TB102, TB103, and TB104 on the CP1 control board. These alarms are distinct and separate from alarms generated by configured channels on the CP3 datalogger board.

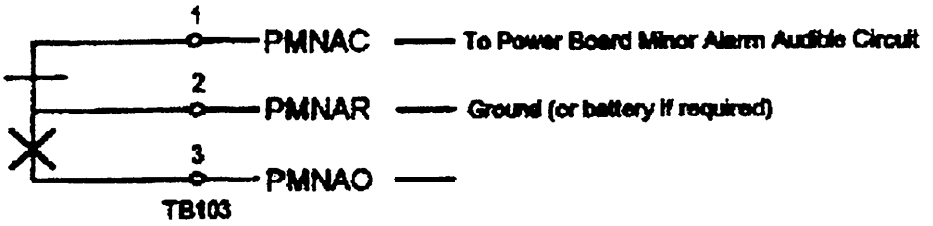
Form-C relay contacts are used, consisting of:

- Normally open (0).
- Return (R).
- Normally closed (C).

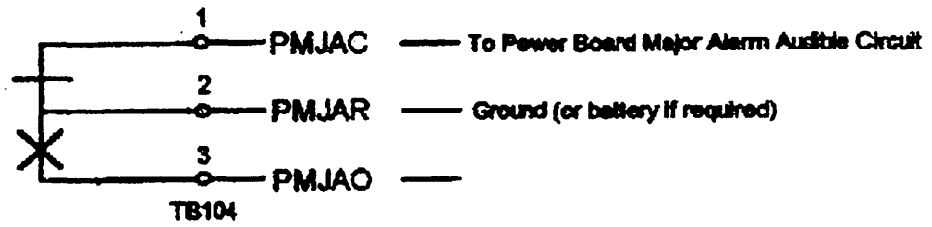
6.4 Connections from the ECS-6U to co Alarm Circuits, continued

Normally closed (C), shown as ------- |-------- in the following illustrations, is defined as a contact that is closed to the return (R) during the alarm state. Normally open (0), shown as -------X------- in the following illustrations, is defined as a contact that is open to the return (R) during the normal state.

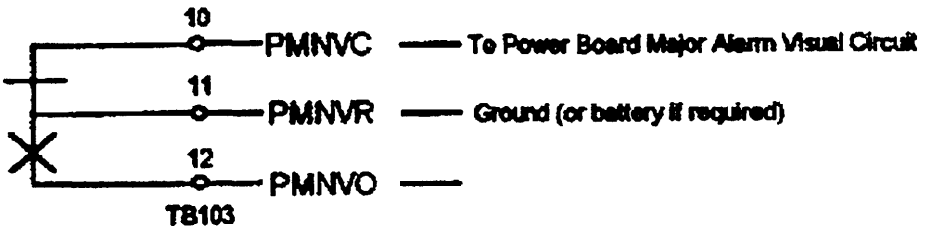
The following illustrations show what alarms make up the major/minor aiarms (audibie, visual, and sent).



PMNA – Power Minor Audible Alarm
(Active during an RFA, MNF, RMN, and UPF)

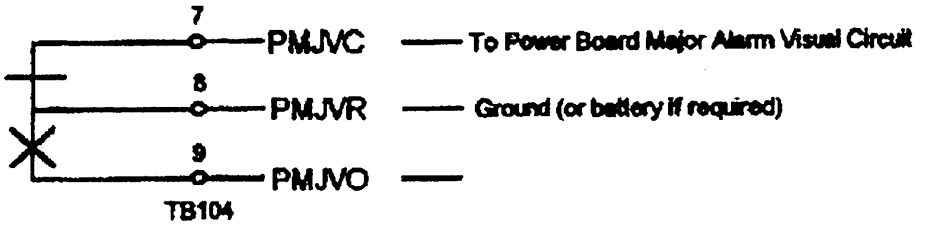


PMJA – Power Major Audible Alarm
(Active during a BD, HV, RMJ, and MJF)



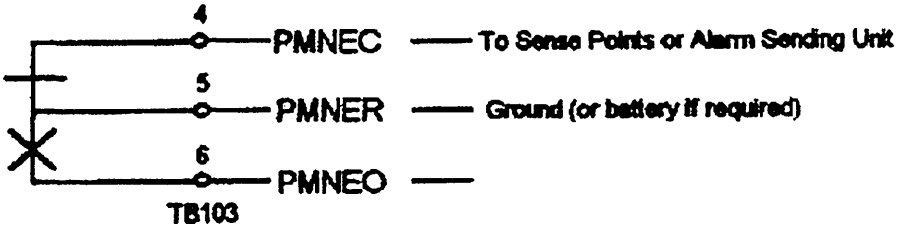
PMNV- Power Minor Visual Alarm
(Active during an RFA, MNF, RMN, and UPF. Use if the power board has separate audio/visual alarms.)

6.4 Connections from the ECS-6U to co Alarm Circuits, continued



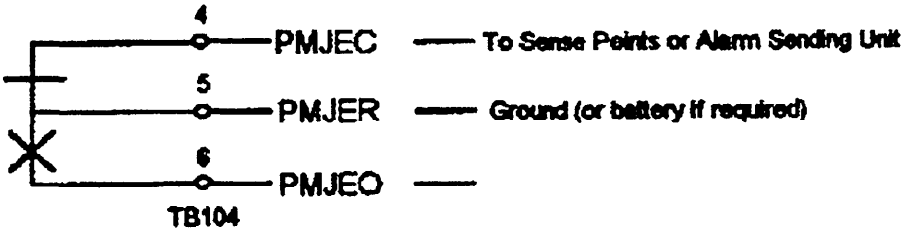
PMJV – Power Major Visual Alarm

(Active during a BD, HV, RMJ, and MJF. Use if the power board has separate audio/visual alarms.)



PMNE – Power Minor Sending Alarm

(Active during an RFA, MNF, RMN, and UPF. This will be tied to the switching sense point assigned to Power Minor.)



PMJE – **Power Major Sending Alarm**

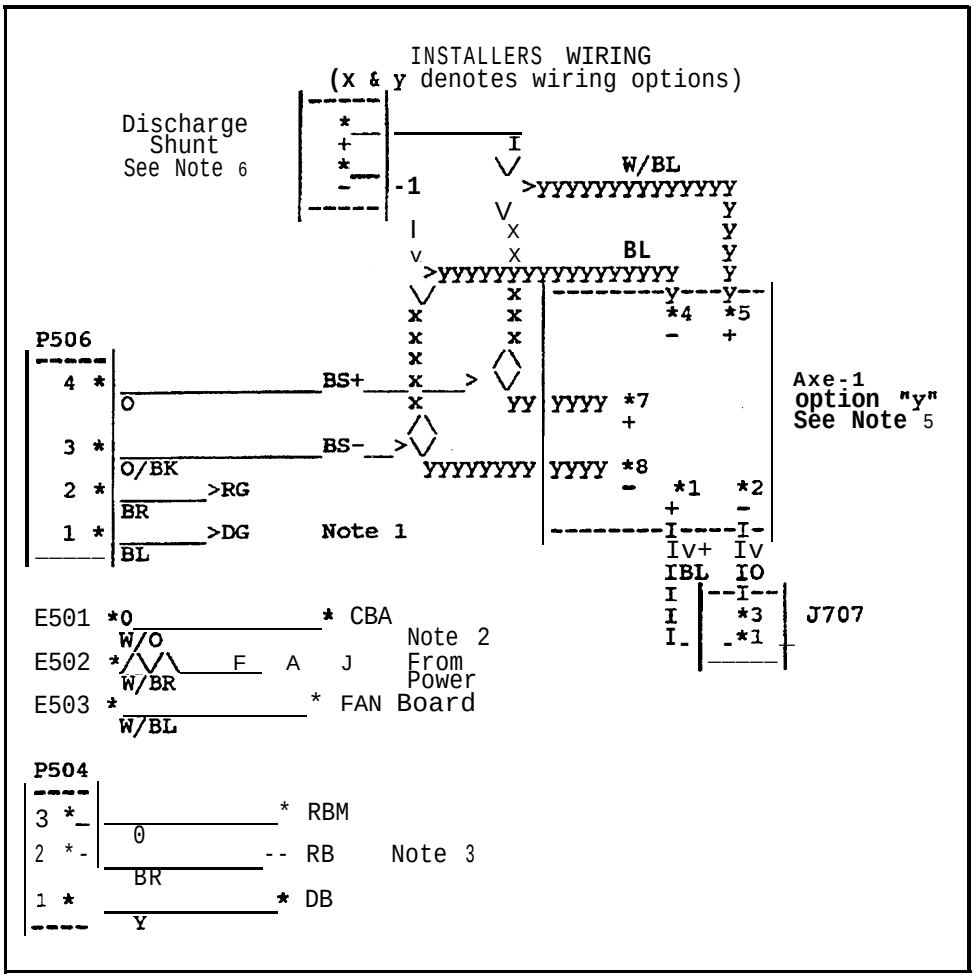
(Active during a BD, HV, RMJ, and MJF. This will be tied to the switching sense point assigned to Power Major.)

6.5 Installer Notes and Wiring

Refer to the Lineage 2000 ECS-6U Cabling Diagram T-8312230, Figure K, for the location of E501, E502, E503, P504, and P506 on the BAD-8 card (fuse board) located on the door of the ECS-6U. Colored wiring indicated is KS22247 or equivalent, 18-24 gauge.

The following illustration shows the installer outside unit wiring of the ECS-6U (Lineage 2000 ECS-6U Power Systems Specification J85501E-1). The illustration does not show:

- Rectifier cabling (refer to PAGES for details).
- Remote alarm cabling (refer to PAGES for details).
- Channel data inputs or control relay wiring.



Analog and digital data/control wiring will be engineered in Phases 2 and 3.

Refer to Lineage 2000 ECS Controller Options manual 167-790-l 09.

NOTE: The information in the illustration does not supersede the "J," "SD," or "T" AT&T drawings. It is an attempt to clarify the information provided in those drawings.

6.5 Installer Notes and Wiring, continued

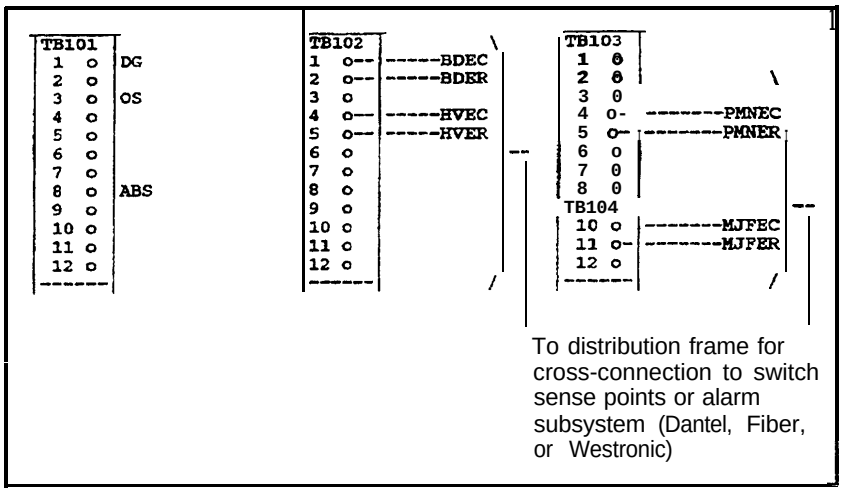
Engineering is to include the following notes in the work order package.

Note	Explanation	
1	RG	Regulation ground terminates on the charge ground bus bar at or near the batteries.
	DG	Discharge ground terminates on the discharge ground bus bar at the power board.
2	CBA	Circuit breaker alarm is not always required. This is the circuit breaker panel alarm from the discharge circuit breaker panels on power plants using circuit breakers.
	FAJ	Fuse Alarm major is from major alarms associated with the power board and distribution bays (PDU, PDUF, etc.). This lead must have a 1000-ohm resistor in series with it.
	FAN	Fuse Alarm minor is from minor alarms associated with the power board and distribution bays. This lead must have a 1000-ohm resistor in series with it.
3	RBM	Boost Charge panel. This is not used in GTE systems and is only required for FT series and AT&T power plants.
	RB	Regulation battery. This lead terminates on the charge battery bus bar at or near the batteries.
	DB	Discharge battery. This lead terminates on the discharge battery bus bar at or near the power board.
4	T+ , T-, R + , and R- are on CP2 TB201 card Terminals 4, 3, 2, and 1, respectively. These will connect to the RS-232/RS-485 convener. Refer to Lineage 2000 ECS Controller Options manual 167-790-109, Table 3E.	
5	Based on an AT&T option, the AKC1 card can work with a 10,000- and 15,000-amp shunt. AT&T Engineering will provide the resistor that Area Installation must add to the AKC1 card. When the resistor is provided: A. Add the resistor (in parallel with the R9 resistor) to the AKC1 card.' B. Stamp the front and rear of the panel mounting of the AKC1 card with "AKC1 modified, added resistor in parallel with R9." C. Update the PAGES drawing to show the modification. D. Update the COMER record to reflect the modification.	

(continued)

6.5 Installer Notes and Wiring, continued

Note	Explanation
6	When the existing rectifier external sense and control leads are changed out in the wiring to the controller (+ R, -R), do one rectifier at a time. The rectifiers might need to be readjusted using a meter at the batteries to make up for the additional voltage drop of the longer leads. **NOTE: The controller must be connected to the shunt and the associated fuse placed in the front of the controller panel before the rectifier is turned back on.**
7	Wire in rectifier restart leads only if the rectifiers are capable of restart.
8	The following illustration shows the power alarms to be used for Phase 1 installations. **NOTE: These discrete alarms will be used until X.25/TL1 capabilities exist.**



BDEC, BDER	BD alarm. Assign this alarm to LV alarm on Scan Point 20.
HVEC, HVER	HV alarm. Assign this alarm to -48V HV alarm on Alarm Point 19.
MJFEC, MJFER	Major Fuse alarm. Assign this alarm to power distribution fuse alarm on Alarm Point 21.
PMNEC, PMNER	Power Minor alarm. Assign this alarm to rectifier failure -48V on Alarm Point 17.

(continued)

6.5 Installer Notes and Wiring, continued

Note	Explanation
8 (cont.)	TB101, TB102, TB103, and TB104 are located on the 113A2 card (refer to Sheet B5 of AT&T drawing SD-83122-01). Test the discrete alarms obtained from the AT&T ECS-6U controller with the NOC at **1-800-483-6662.** **NOTE: If** the CO **is not set up to GTE/NOC standard alarm points, use the existing alarm sense points (refer to Engineering practice E-SW-200-000-008).**
9	A telephone line must be connected at the controller for dial-up access to the voice response system with a: • Touch-tone telephone. OR • Terminal. Coordinate a TSR with local maintenance personnel for the issuance of a dial-up line.
10	Coordinate with local maintenance the issuance of a TSR for pad port assignments for X.25/TL1 capabilities. If an X.25/TL1 pad is not available at the time of cutover: A. Coil the AT&T-provided 2-pair cable. B. Label the cable for appropriate use. C. Put the cable in a convenient location.
11	Unless instructed otherwise by the NOC, set the unit according to procedures in the installation manual to disable the superuser capability. This will not eliminate the ability to use the capabilities of the user log-in. When the support plan is completed, the superuser capability can be activated. **Activation of the superuser capability will require a visit to the CO for DIP switch setting.**
12	If any work order is completed without the dial-up access capability activated, the NOC and Network Maintenance have requested that the function not be made available. If the work order has not been completed, the dial-up capability should be provided.

6.6 X.25 Cabling

An X.25 connection to the Al&T ECS-6U is achieved through a connection to an external PAD, which serves as an asynchronous TL1 port and the X.25 synchronous network. The asynchronous connection is accomplished through an RS-485to-RS-232 converter. A 100-foot RS-485 cable is provided with the standard GTE model. This cable must be:

- Connected to the ECS-6U.
- Stored (coiled up) until it is connected to a PAD.

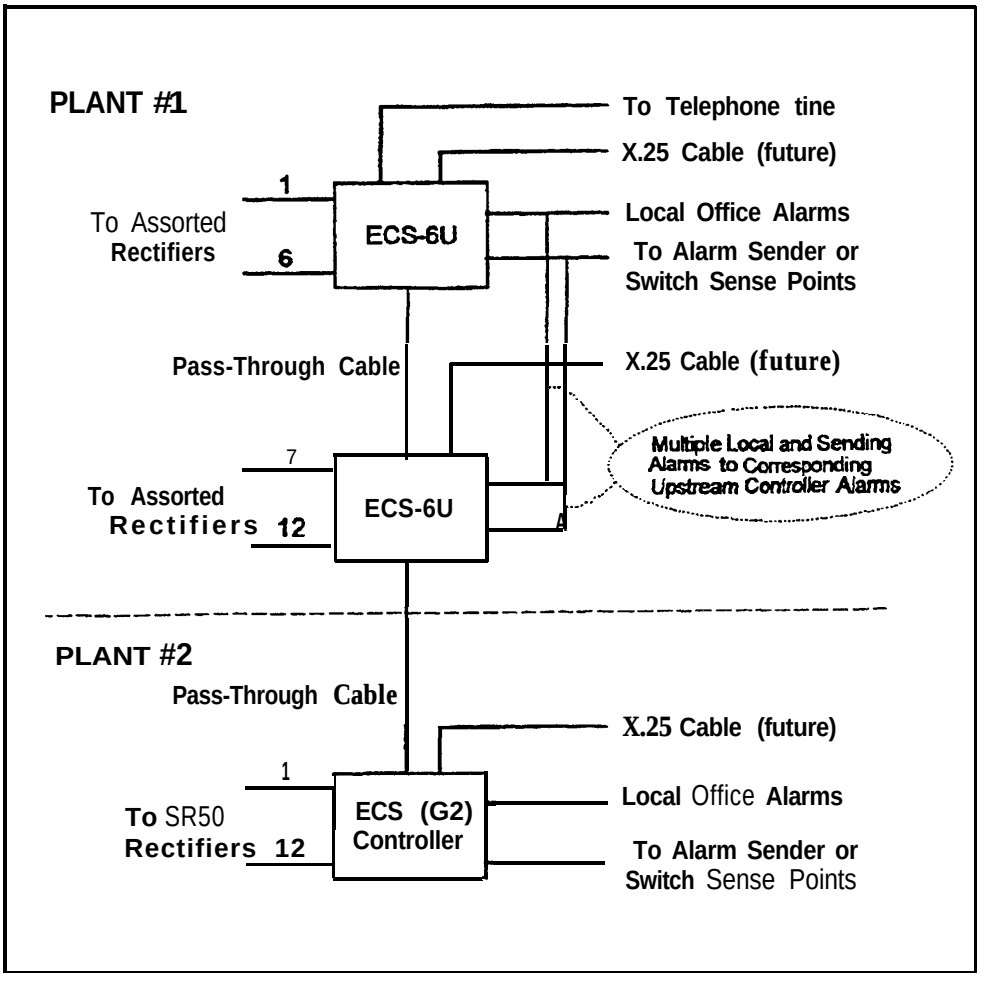
Maintenance must be notified during the installation so that it can issue a TSR at the appropriate time.

6.7 Telephone Access Cabling

The installer must advise Maintenance to issue a TSR for a telephone line connection. If this is a multicontroller installation, only one telephone line is required for the first unit. All downstream controllers will use the "pass-through" feature of the ECS-6U for all controller-to-controller communications.

6.8 Intercontroller Wiring for Multiple ECS Installations

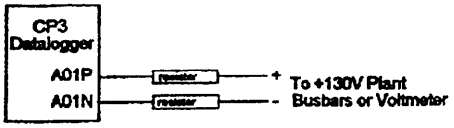
The following illustration shows intercontroller wiring for multiple ECS installations.



Configuring Analog Channels	Each channel of the datalogger can be regarded as a recording voltmeter assigned by the user and can be used to gather information, record events, and provide alarms (analog or binary}. The configuration information is assigned by the user.
Channel Description	This is a description of what the channel is monitoring. If TL1 is operational, this will contain the character text to describe the alarm.
Enable or Disable	This activates the channel for scanning.
Type	This informs the system of the type of voltage to be measured (+ DC, **-DC,** or AC).
Range	This selects the full scale voltage range that will be displayed. The scale that most closely matches the voltage to be read will provide the greatest accuracy. The measured voltage cannot exceed the range selected. Ranges are 150 mV, 6V, 60V, and 15OV.
Scale Factor	The product of the measured voltage multiplied by the entered numerical factor will become the channel value. Straight voltage measurements, such as 52V plant voltages, use a scale factor of 1. When using shunts, the voltage being measured is a mathematics ratio to the voltage. The scale factor of a 600-amp, 50-mV shunt is 600/50 = 12.
Alarm Thresholds	This sets the upper and lower alarm parameters for each individual channel. The polarity must agree with the Type category. To treat the analog channels as binary, configure the upper alarm value above the voltage that is measured when the circuit is normal.
Units	This defines the channel values as VDC, AMPS, DEGF, KW, and KVA. The unit description can consist of up to five characters.

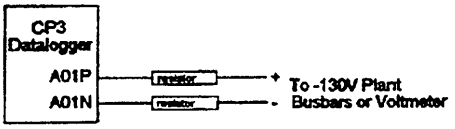
Exhibit 1

Typical Monitoring of +130 Volt Plant



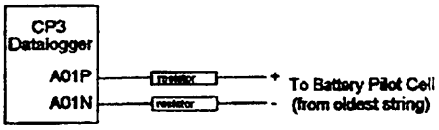
Description	+130V Plant Voltage
Enable/Disable	E
Type	+DC
Range	150V
Scale Factor	1
Alarm Thresholds	127.5 (L); 132.5 (H)
Units	V

Typical Monitoring of -130 Volt Plant



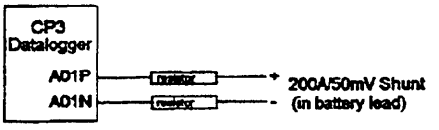
Description	-130V Plant Voltage
Enable/Disable	E
Type	-DC
Range	150V
Scale Factor	1
Alarm Thresholds	-127.5 (L); -132.5 (H)
Units	V

Typical Monitoring of Battery Pilot Cell Voltage



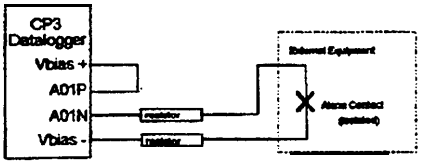
Description	48V Battery Pilot Cell
Enable/Disable	E
Type	+DC
Range	5V
Scale Factor	1
Alarm Thresholds	1.9 (L); 2.35 (H)
Units	V

Typical Monitoring of -48v Distribution Loads



Description	-48V Load A
Enable/Disable	E
Type	+DC
Range	150mV
Scale Factor	4
Alarm Thresholds	none (L); 161.0 (H)
Units	A

Typical Monitoring of External Alarms



Resistor must be on Vbias + Lead for Positive Plants

Description	External UPS Alarm
Enable/Disable	E
Type	+DC
Range	60V
Scale Factor	1
Alarm Thresholds	none (L); 20.0 (H)
Units	V

Exhibit 1 - Datalogger (Page 2 of 2)

Control Reiay Programming

The status of each of eight Form-C relays can be individually controlled by its own program line statement. The program line statement can consist of a single or several program words. The relay will operate when all program words become TRUE. Program words are themselves TRUE when the associated alarm, time, and/or event are in effect.

The categories of program words are ECS Alarm, Datalogger Channel Alarm, Control Relay Operation, Control Keyword, Time Keyword, and Logic Function.

A program line can consist of a single program word from the Control or Time Keyword categories. It may also consist of one or more program words from the ECS Alarm, Datalogger Alarm, and/or Control Relay Operation categories, which are then combined with Logic Function words.

Datalogger Channel Alarm

Al -Al 6	Each of the 16 analog channels can be used to energize a control relay. The condition is TRUE when the user-configured upper and lower alarm limit is surpassed.

Control Relay Operation

CR1-CR8	Each of the eight control relays can be used to energize another control relay. The condition for the relay to be controlled is TRUE when the program control line for the source relay becomes true.

Control Keyword

ON	This will energize a relay immediately.
OFF	This will deenergize a relay immediately.

Time Keyword

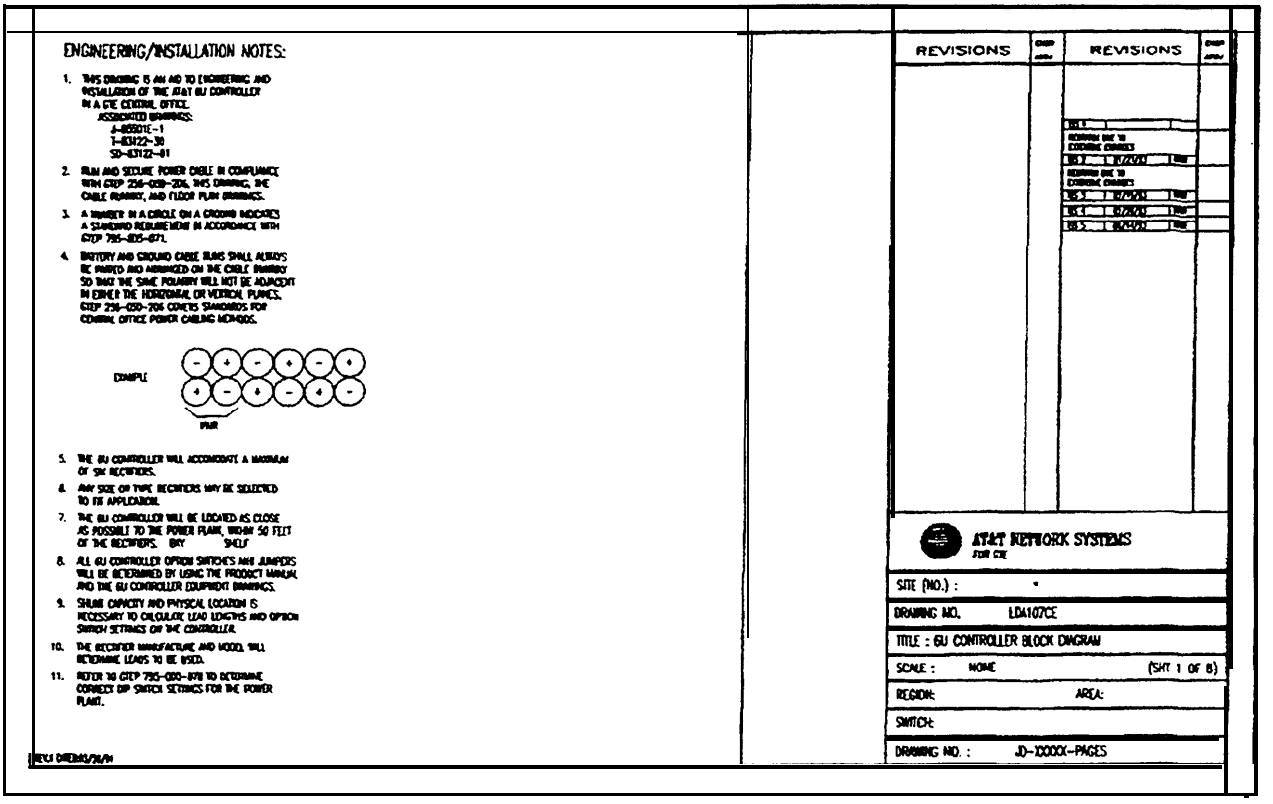
Dx	This indicates a day of the month, where x = l-31. The condition is TRUE on a specified day of the month for the full 24-hour period of that day.

Exhibit 2 - **Control** Relays **(Page 1 of** 2)

Program Words

ACF	AC input power has failed to one of the rectifiers.
BD	Battery voltage has decreased below voltage level set by DIP SW 103 on the CP1 circuit pack.
EXA	An alarm generated from a connected AT&T controller.
HV	Battery voltage has increased above the preset level set by DIP SW 101 or DIP 102 on the CP1 circuit pack.
MJF	A distribution fuse or circuit breaker has operated or a critical control fuse on CP5 LVD/fuse board has operated.
MNF	A control fuse on CP5 LVD/fuse board has operated.
OS	A battery string circuit breaker has been turned off or tripped.
RFA	One of the connected rectifiers has failed.
RMJ	Major failure condition in the ringer plant.
RMN	Minor failure condition in the ringer plant.
TA	TA indicating that a rectifier has failed due to overheating.
UEQ	Alarm condition indicating the failure of the plant to enter the Equalize mode.
UFL	Alarm condition indicating the failure of the plant to enter the Float mode.

Exhibit 2 - Control Relays (Page 2 of 2)



ENGINEERING/INSTALLATION NOTES:

1. THIS DRAWING IS AN AID TO ENGINEERING AND INSTALLATION OF THE AT&T 6U CONTROLLER IN A CTE CENTRAL OFFICE.
   ASSOCIATED DRAWINGS:
   J-855011E-1
   T-63122-30
   SD-63122-01
2. RUN AND SECURE POWER CABLE IN COMPLIANCE WITH GTEP 236-000-206. THIS DRAWING, THE CABLE RUNWAY, AND FLOOR PLAN DRAWINGS.
3. A NUMBER IN A CIRCLE ON A GROUND INDICATES A STANDARD REQUIREMENT IN ACCORDANCE WITH GTEP 795-805-671.
4. BATTERY AND GROUND CABLE RUNS SHALL ALWAYS BE PAIRED AND ARRANGED ON THE CABLE RUNWAY SO THAT THE SAME POLARITY WILL NOT BE ADJACENT IN EITHER THE HORIZONTAL OR VERTICAL PLANES. GTEP 236-000-206 COVERS STANDARDS FOR COMMON OFFICE POWER CABLING MOMODS.

EXAMPLE

PAIR

5. THE 6U CONTROLLER WILL ACCOMODATE A MAXIMUM OF SIX RECTIFIERS.
6. ANY SIZE OR TYPE RECTIFIERS MAY BE SELECTED TO FIT APPLICATION.
7. THE 6U CONTROLLER WILL BE LOCATED AS CLOSE AS POSSIBLE TO THE POWER PLANT, WITHIN 50 FEET OF THE RECTIFIERS. BAY SHELF
8. ALL 6U CONTROLLER OPTION SWITCHES AND JUMPERS WILL BE DETERMINED BY USING THE PRODUCT MANUAL AND THE 6U CONTROLLER EQUIPMENT DRAWINGS.
9. SHUNT CAPACITY AND PHYSICAL LOCATION IS NECESSARY TO CALCULATE LEAD LENGTHS AND OPTION SWITCH SETTINGS OF THE CONTROLLER.
10. THE RECTIFIER MANUFACTURE AND MODEL WILL DETERMINE LEADS TO BE USED.
11. REFER TO GTEP 795-000-878 TO DETERMINE CORRECT DIP SWITCH SETTINGS FOR THE POWER PLANT.

REVISIONS | REVISIONS

AT&T NETWORK SYSTEMS

SITE (NO.) :

DRAWING NO. LDA107CE

TITLE : 6U CONTROLLER BLOCK DIAGRAM

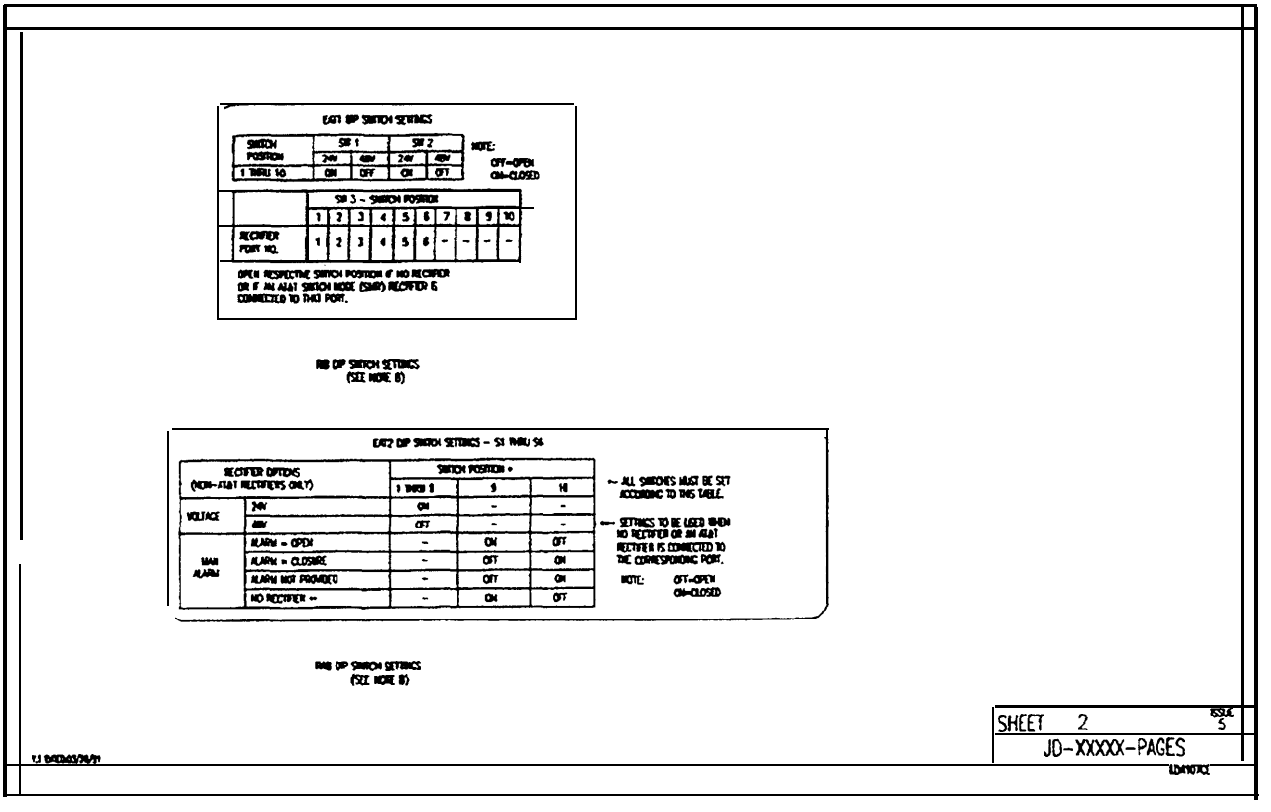
SCALE : NONE (SHT 1 OF 8)

REGION: AREA:

SWITCH:

DRAWING NO. : JD-XXXXX-PAGES

Exhibit 3 - PAGES Sheet 1



EAST DIP SWITCH SETTINGS

SWITCH POSITION	SW 1		SW 2	
	24V	48V	24V	48V
1 THRU 10	ON	OFF	ON	OFF

NOTE: OFF=OPEN ON=CLOSED

	SW 3 - SWITCH POSITION									
	1	2	3	4	5	6	7	8	9	10
RECTIFIER PORT NO.	1	2	3	4	5	6	-	-	-	-

OPEN RESPECTIVE SWITCH POSITION IF NO RECTIFIER OR IF AN AT&T SWITCH MODE (SMR) RECTIFIER IS CONNECTED TO THAT PORT.

RIB DIP SWITCH SETTINGS (SEE NOTE 8)

EAST DIP SWITCH SETTINGS - S1 THRU S4

RECTIFIER OPTIONS (NON-AT&T RECTIFIERS ONLY)		SWITCH POSITION # 1 THRU 8	9	10
VOLTAGE	24V	ON	-	-
	48V	OFF	-	-
MAN ALARM	ALARM = OPEN	-	ON	OFF
	ALARM = CLOSURE	-	OFF	ON
	ALARM NOT PROVIDED	-	OFF	ON
	NO RECTIFIER **	-	ON	OFF

← ALL SWITCHES MUST BE SET ACCORDING TO THIS TABLE.

← SETTINGS TO BE USED WHEN NO RECTIFIER OR AN AT&T RECTIFIER IS CONNECTED TO THE CORRESPONDING PORT.

NOTE: OFF=OPEN ON=CLOSED

RAB DIP SWITCH SETTINGS (SEE NOTE 8)

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Exhibit 3 - PAGES Sheet 2

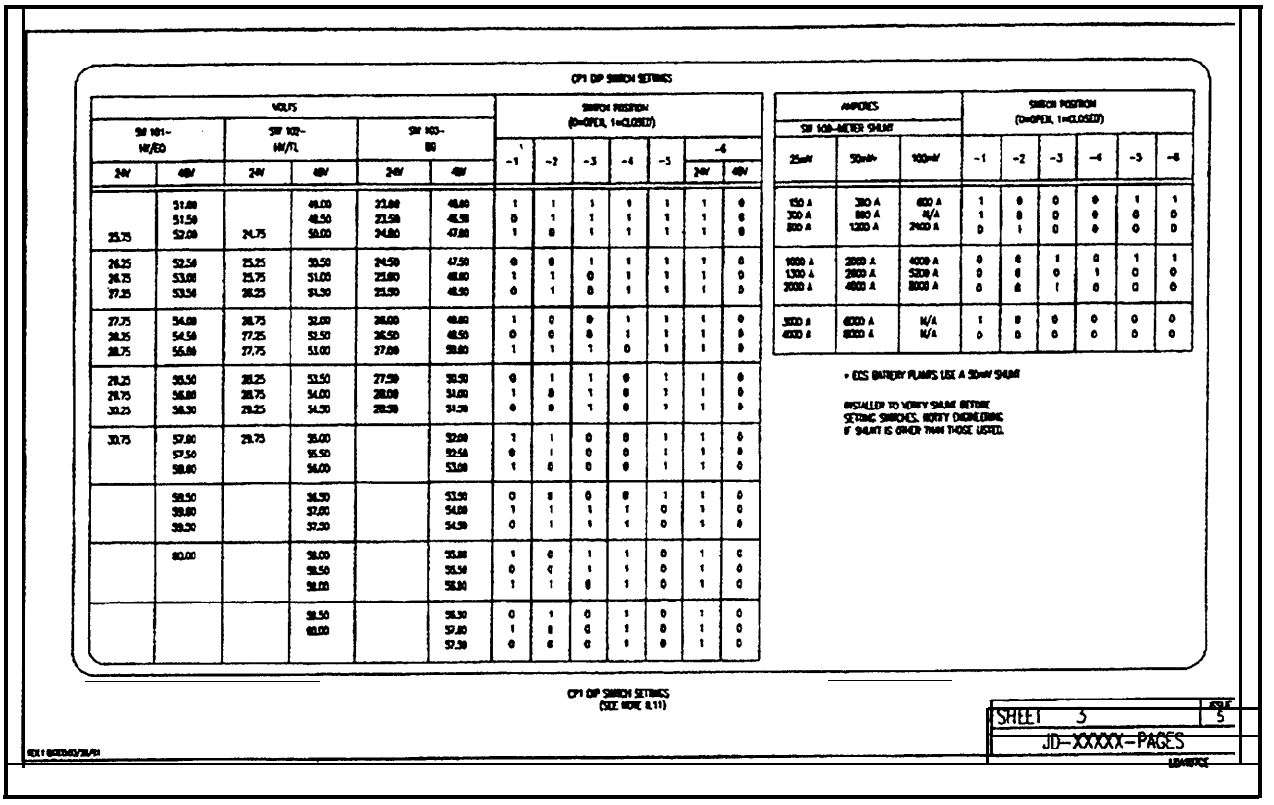


Exhibit 3 - PAGES Sheet 3

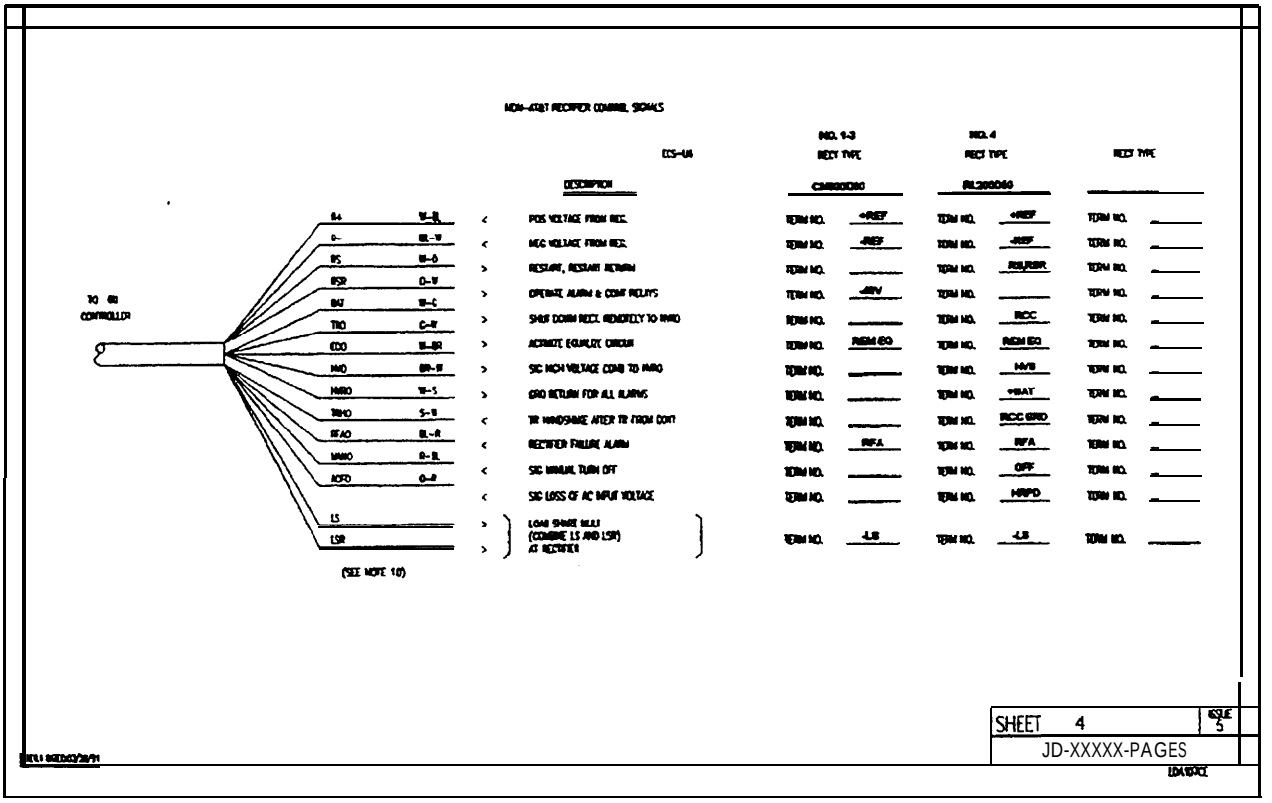


Exhibit 3 - PAGES Sheet 4

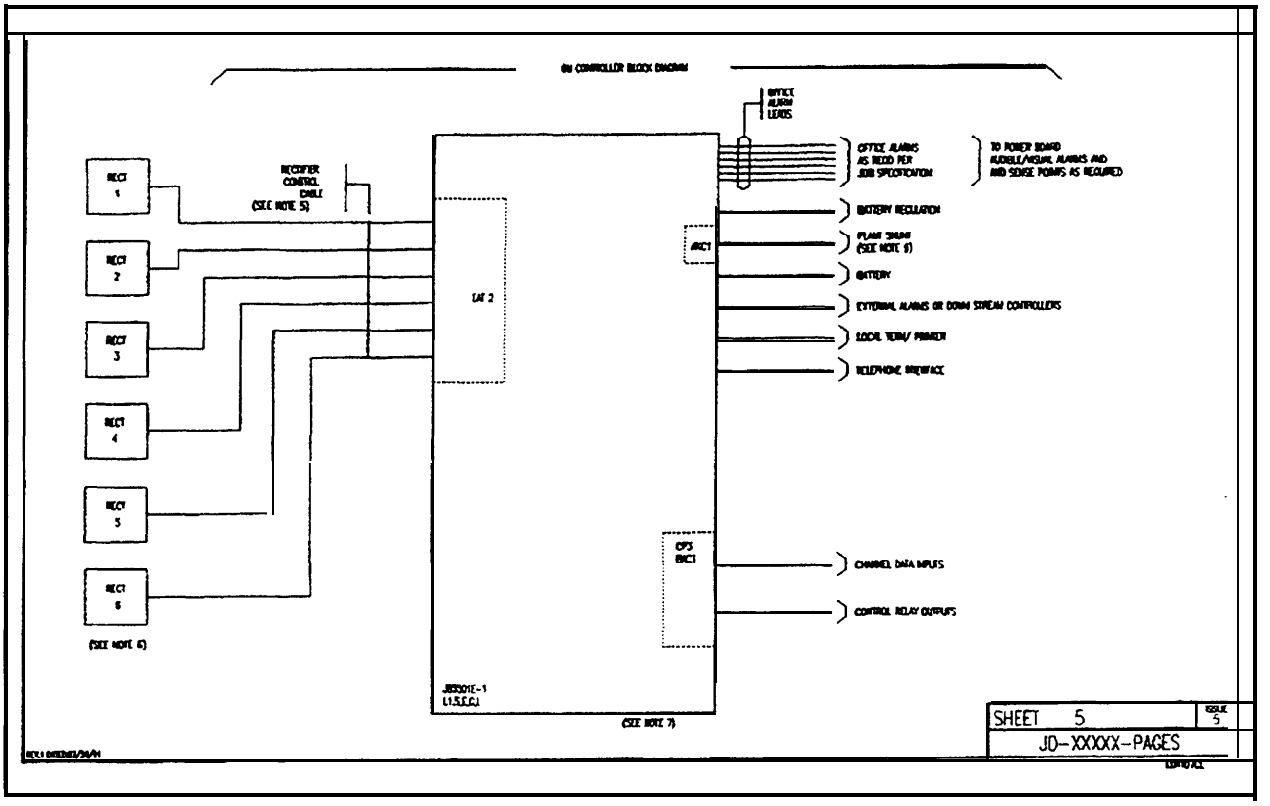


Exhibit 3 - PAGES Sheet 5

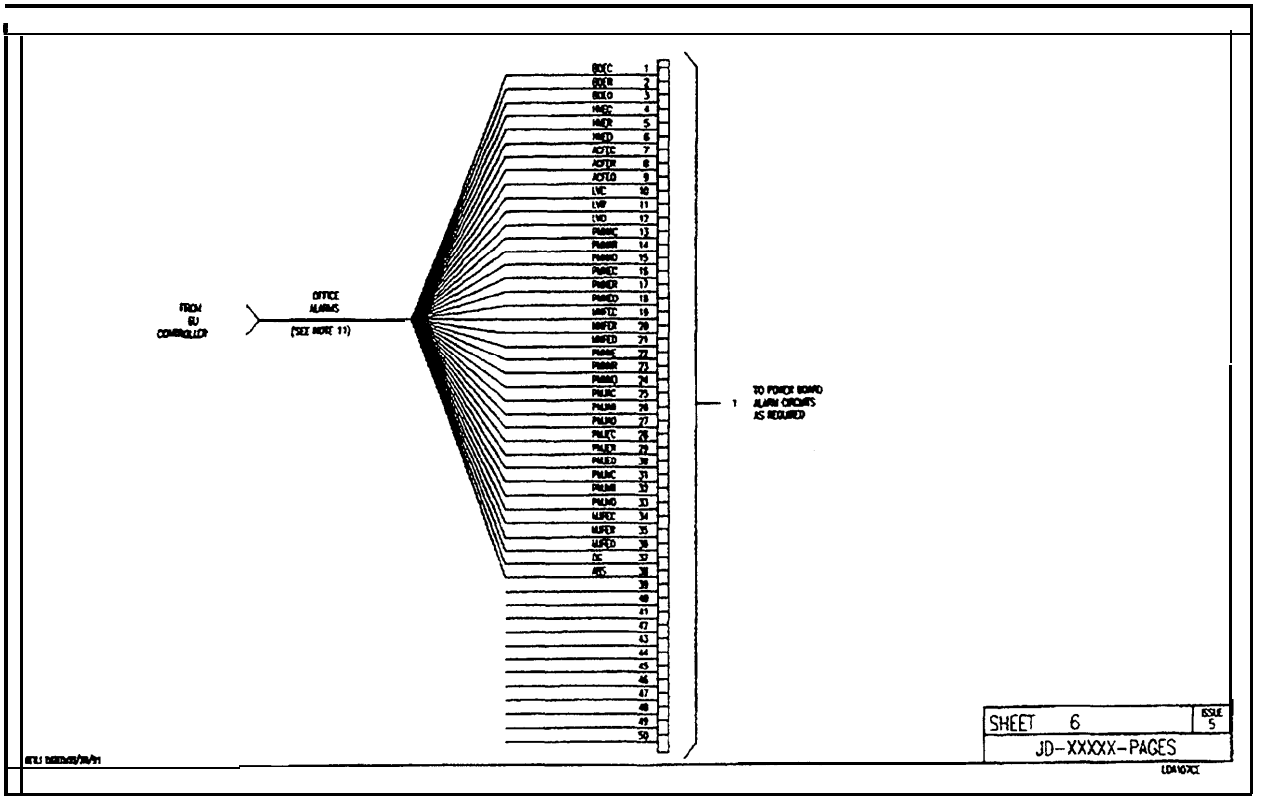
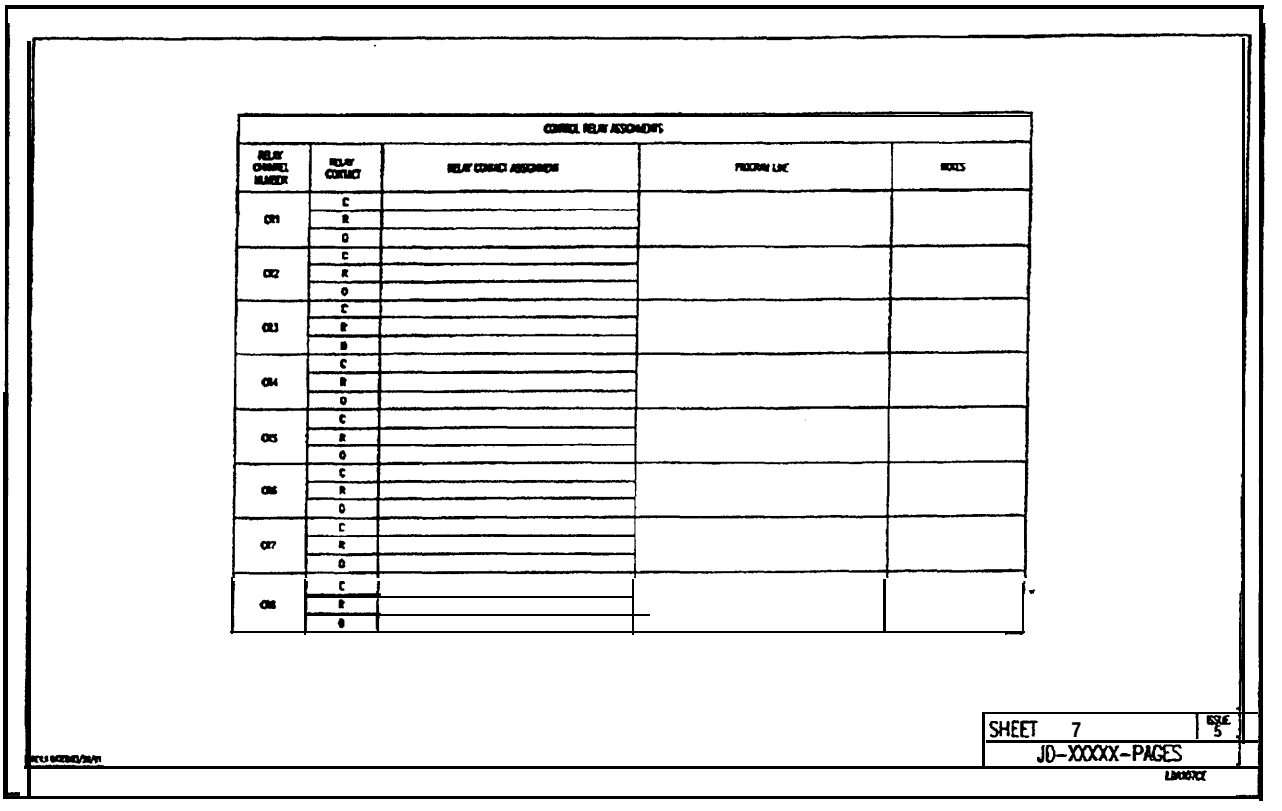


Exhibit 3 - PAGES Sheet 6



CONTROL RELAY ASSIGNMENTS

RELAY CHANNEL NUMBER	RELAY CONTACT	RELAY CONTACT ASSIGNMENT	PROGRAM LOGIC	NOTES
CR1	C			
	R			
	O			
CR2	C			
	R			
	O			
CR3	C			
	R			
	O			
CR4	C			
	R			
	O			
CR5	C			
	R			
	O			
CR6	C			
	R			
	O			
CR7	C			
	R			
	O			
CR8	C			
	R			
	O			

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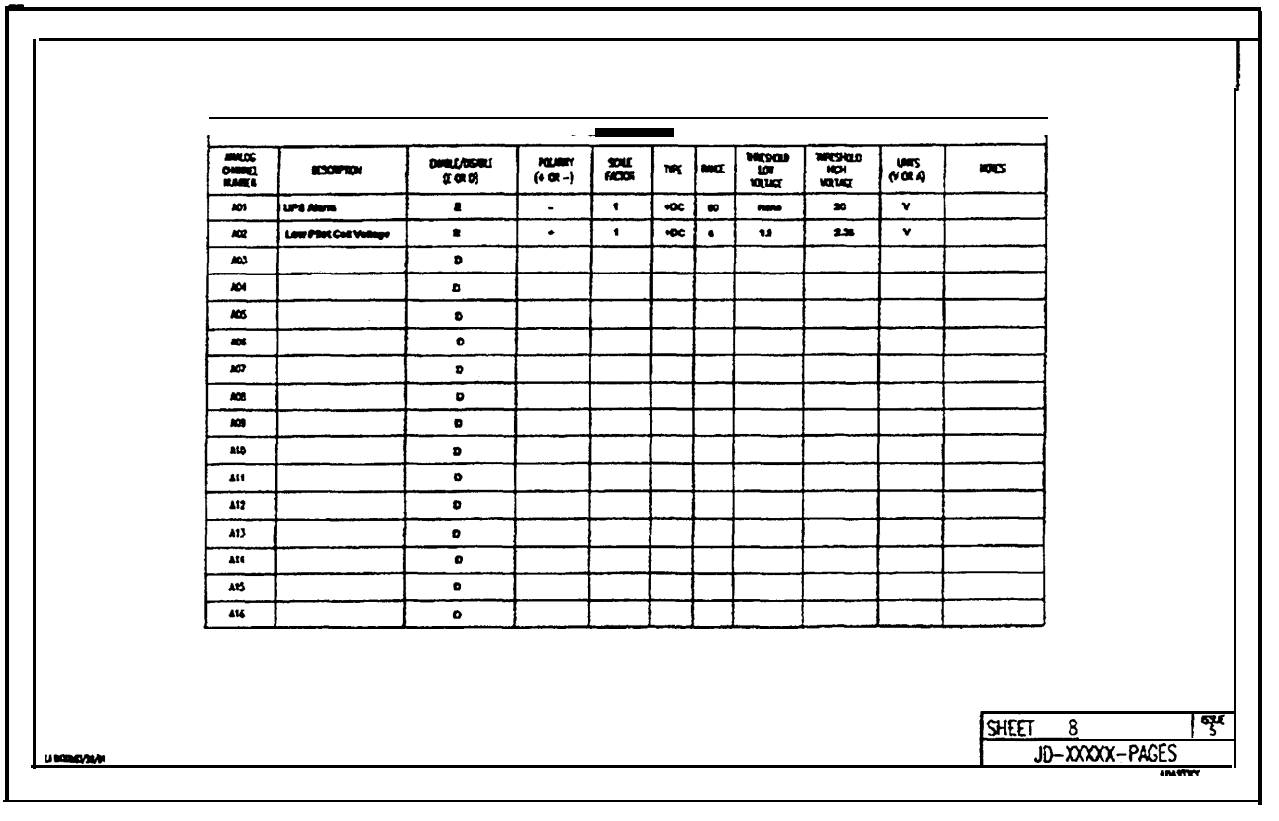
Exhibit 3 - PAGES Sheet 7



ANALOG CHANNEL NUMBER	DESCRIPTION	ENABLE/DISABLE (E OR D)	POLARITY (+ OR -)	SCALE FACTOR	TYPE	RANGE	THRESHOLD LOW VOLTAGE	THRESHOLD HIGH VOLTAGE	UNITS (V OR A)	NOTES
A01	UPS Alarm	E	-	1	VDC	60	none	30	V	
A02	Low Pilot Coil Voltage	E	+	1	VDC	6	1.8	2.35	V	
A03		D								
A04		D								
A05		D								
A06		D								
A07		D								
A08		D								
A09		D								
A10		D								
A11		D								
A12		D								
A13		D								
A14		D								
A15		D								
A16		D								

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Exhibit 3 - PAGES Sheet 8

Description

The Transaction Language (TL1) command interface for the ECS controller enables direct communication with the centralized TransVu II monitoring system. For each alarm, the ECS sends a string of eight characters to describe the alarm condition. The ECS controller can be set up to interface with the data network by direct RS-485 interface, direct RS-232 interface (using an RS-485to-RS-232 converter), or X.25 interface (using an RS-485-to-RS-232 converter to an External PAD).

Condition Types and Descriptions

The following alarms and descriptions are listed from BELLCORE TA-NWT-001360. GTE requirements may differ depending on the capabilities of the NOC and maintenance and support practices_ They are configured in the ECS-6U during setup as required.

Alarm	TL1 String	Alarm Description
FA	DCPLFUSE	Plant fuse/breaker has operated
	DCPLTOVOLTDIC	Low voltage load disconnect operated
HV1	DCPLTHIVOLT	Plant above the high voltage threshold
LV1	DCPLTLOVOLT	Plant below the low voltage threshold
LV2	DCPLWLOVOLT	Plant below the very low voltage threshold
RFA	RECTFAIL	Rectifier has failed
TA	RECTFANFAIL	Rectifier fan has failed
ACF	RECTACFAIL	Rectifier has lost AC input
FA	RECTFUSE	Rectifier fuse/breaker has operated
ON/OFF	RECTOFF	Rectifier is turned off
EQ	RECTEQ	Rectifier in Equalize mode
BD	BATDISCHG	Battery is discharging
	BATDISCNT	Battery is disconnected
	BATPCVAR	Battery pilot cell voltage variation
FA	DISTFUSE	Distribution fuse has operated

Exhibit 4 - TL1