Section 1-4

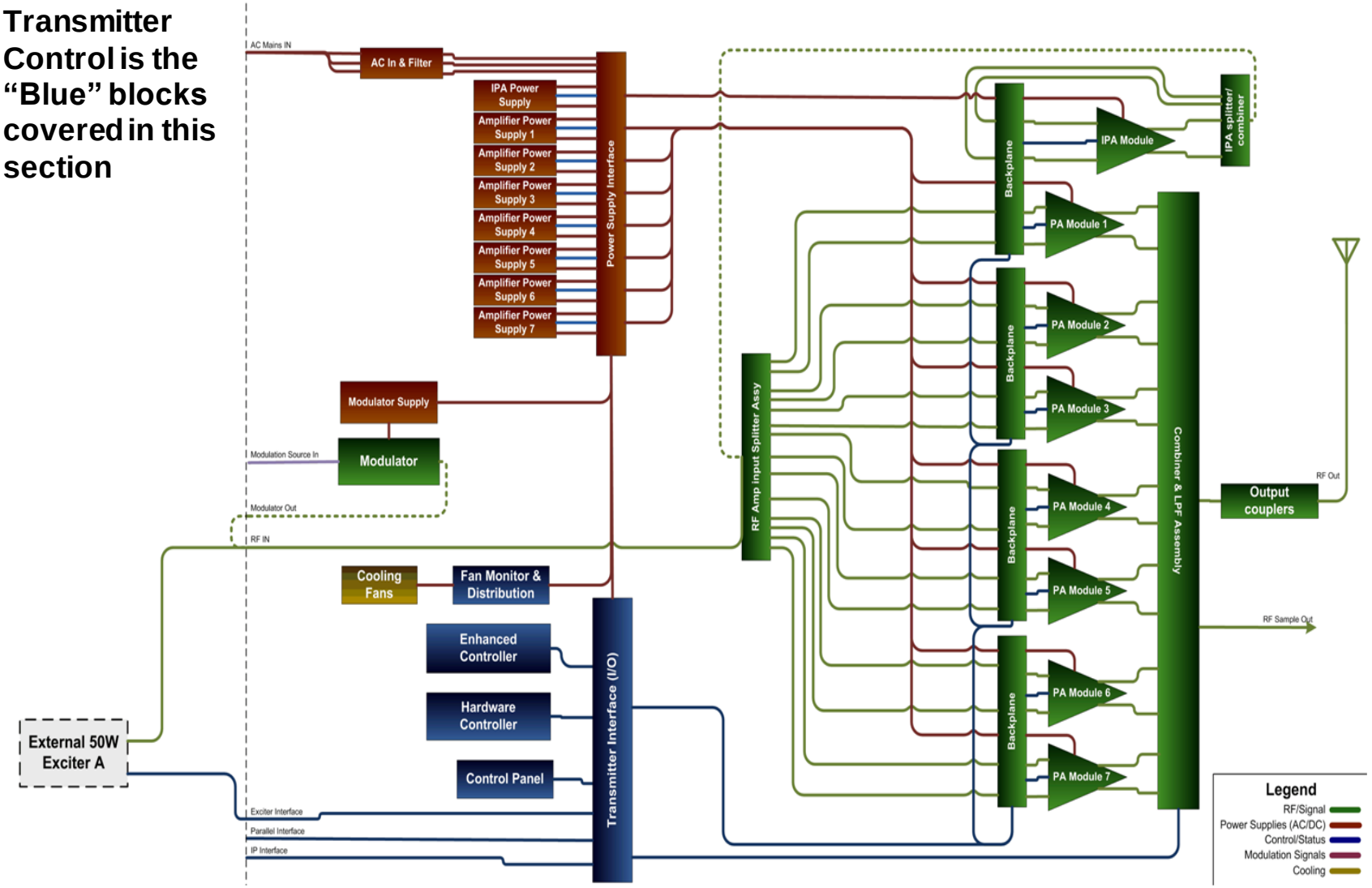
FAX Control

In this section the FAX control will be covered. Metering, faults and putting it together with the power supplies and RF chain to get a better understanding of the complete system

Drawing 801-0234-071 Sheet 1

Flexiva™ FAX Series

Transmitter Control is the "Blue" blocks covered in this section



FAX Control Board Functions

Control/Display Board

Hardware Control for Backup Controller when Micro fails

User Switch Inputs – ON/OFF; Raise/Lower; Remote Enable/Disable; Setup; Power; Status

Front panel status indicator LED's – Exciter; Drive Chain; Power Amp; Power Supply;Output; System

Interfaces to the LCD Screen

Interfaces the Micro Module – Daughter Card

Front and rear Ethernet ports controlled here – If board fails system will go to backup control and the Ethernet ports will no longer function

APC Reference is generated on board and sent to APC circuit on System Interface

Contains Flash – Stores Transmitter Configuration file

Micro Module Board

Contains Coldfire processor

Has power-on-reset circuit

Contain Bootloader

Control/Display LED Definitions

LED	Name	Sheet	Description
DS19	RESTRIKE	4	Primary Hardware Control Restrike
DS18	DRIVE CHAIN B ACTIVE	4	Indicates IPA is on B
DS20	BACKUP CONTROL MODE	7	Indicates that the control has gone into backup mode
DS17	MICRO FAILED	7	Micro Module has failed; WD Pulse not present
DS21	SOFTWARE CONTROL DISABLED	7	Software control is off due to Micro Module fail or backup mode is enabled
DS31	+3.3 V	7	+3.3V Power Supply
DS30	+5V	7	+5V Power Supply
DS0	Diag LED	18	
DS1	Diag LED	18	
DS2	Diag LED	18	
DS3	Diag LED	18	
DS4	Diag LED	18	
DS5	Diag LED	18	
DS6	Diag LED	18	
DS7	Diag LED	18	

Control/Display Test Point Definitions

Point	Name	Sheet	Description
TP1	ON	4	Indicates TX ON request
TP2	OFF	4	Indicates TX OFF request
TP3	HOLDOFF	4	Holds transmitter off, Equip Interlock or AC mains fault LO=TXOFF
TP4	+5V	7	
TP5	+3.3V	7	

FAX Control Board Functions

System Interface Board

Provides Hardware control in Lifesupport mode (Lifesupport is when Micro Module and Control and Display Board have failed)

Operates both as Multi-Unit control and as system interface (to funnel meters and faults to Multi-Unit controller) in FAX20/30/40. Only difference is switch settings. Multi-Unit controller is located in Power Block 1.

APC hardware located on this board

Exciter interface and exciter RF switching

Meter and Fault multiplexing on this card – in FAX20/30/40 gets readings from each power block

Parallel I/O Functions on this board

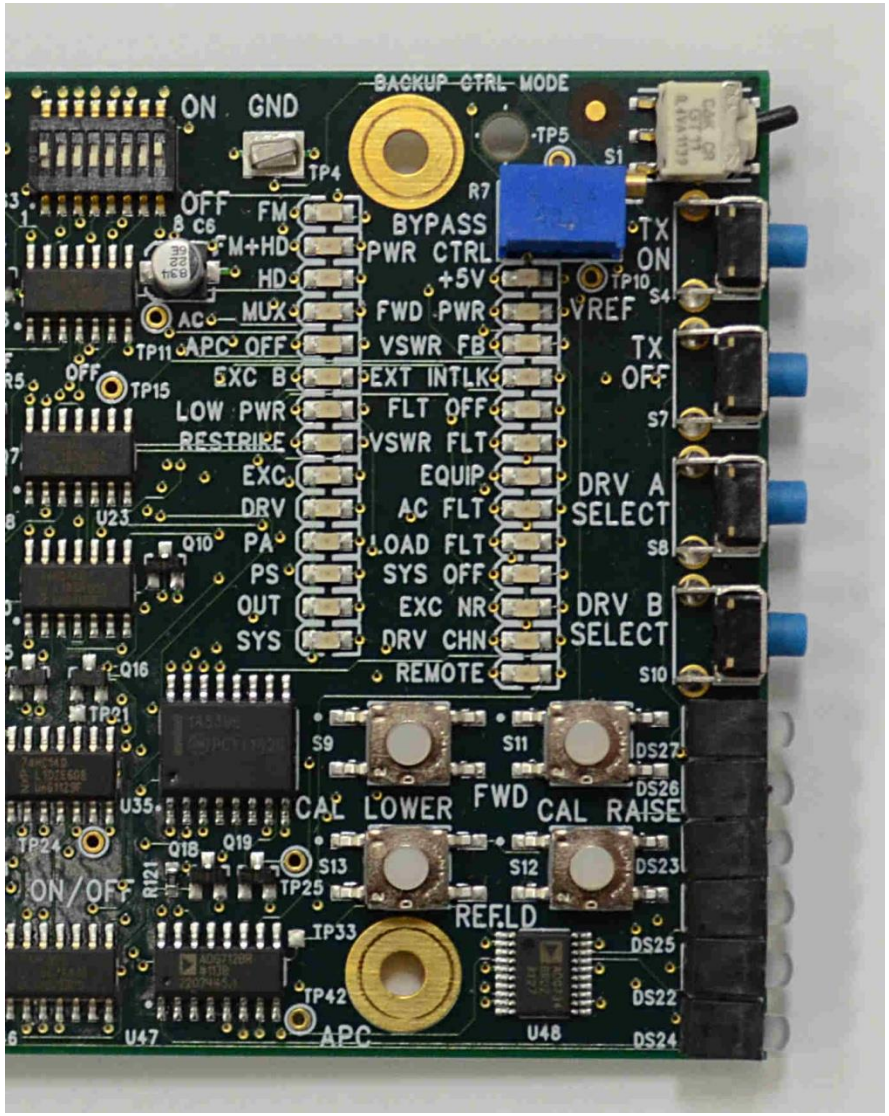
In Lifesupport mode, parallel I/O functions can be enabled or disabled on this board, selected via Switch S2-4

Forward and Reflected power detection

System Status LED's – more comprehensive that front panel LED's

System Interface LED Definitions

LED	Name	Sheet	Description
DS28	SYSTEM-SUM-FAULT	3	System Fault has occurred Check other LED's to troubleshoot
DS29	PS-SUM-FAULT	3	Main Power Supply has failed or AC Mains has dropped below 190 VAC
DS30	DRIVE-CHAIN-SUM-FAULT	3	IPA Drive Chain has faulted
DS31	EXCITER-SUM-FAULT	3	Exciter has faulted - in case of dual exciters this led will not be on unless transmitter is off or both exciters are faulted
DS2	FORWARD POWER LIMIT	9	Indicates power is above 110 %
DS3	VSWR FOLDBACK	9	VSWR Above 1.3:1
DS5	EXTERNAL INTERLOCK	9	External Interlock has opened; must be continuos Ground on J1 Pin 24
DS7	FAULT OFF	9	A fault has occurred that is severe enough to turn transmitter off
DS9	VSWR FAULT	9	VWSR is above 1.3:1
DS11	EQUIPMENT INTERLOCK	9	Equipment Interlock J1 Pin 9 is Grounded; must be open to turn transmitter on
DS13	AC MAINS FAULT	9	AC Mains has dropped below 190 VAC
DS15	LOAD FAULT	9	Reject Load over-temp,fans has faulted or Over 100 % power into load from fan monitor bd on load
DS17	RF MUTE-SYSTEM OFF	9	TX OFF and the system is muted
DS19	RF MUTE-EXC NOT READY	9	one or more exciters not ready
DS20	RF MUTE-DRIVE CHAIN	9	Drive Chain is switching causing the transmitter to mute
DS21	RF MUTE-REMOTE	9	Mute request from Remote I/O J1 Pin 7
DS27	SYSTEM ON	9	TX ON and un-muted
DS26	RF OUTPUT OK	9	RF output between 90 % and 110 % of calibrated power
DS23	REMOTE ENABLE	9	Indicates Remote control via J1 or IP is enabled
DS25	B' Drive ACTIVE	9	IPA has switched to B
DS22	RF MUTE BUS	9	System has been muted via fault or mute request from Remote I/O
DS24	BACKUP CONTROL ENABLED	9	Indicates the Lifesupport has been enabled;micro has failed or Control/Display has failed
DS4	FM ON	9	System is running in FM Only mode
DS6	FM+HD ON	9	System is running FM+HD mode
DS8	HD ON	9	System is running HD Only mode
DS10	MUX ENABLED	9	Indicates MUX activity
DS12	APC OFF	9	APC has been disabled due to fault or calibration mode. Switch S2-7 can also froce APC off
DS14	EXCITER B ACTIVE	9	Exciter has switched to B
DS16	LOW POWER MODE	9	Low Power Mode has been enabled via Remote or front panel;load fault
DS18	RESTRIKE	9	Fault has caused the 3-strike circuit to trip at least one time
DS1	+5V POWER SUPPLY	9	+5 V supply is running
DS32	PA SUMMARY FAULT	10	Indicates PA Module has faulted
DS33	OUTPUT SUMMARY FAULT	10	Indicates RF Output not between 90 & and 110 % of calibrated power



System Interface LED's

These two rows of LED's are important troubleshooting aids

In FAX20/30/40 some LED's are active on System Interface and some on Multi-Unit Interface. The LED's that pertain only to the power block will be active on the System Interface.

CAUTION: DO NOT Press the 4 white pushbutton CAL switches! This will negate Forward and Reflected Power Calibration. Must either do "CAL RESTORE" or Re- calibrate transmitter.

System Interface Test Point Definitions

Point	Name	Sheet	Description
TP22	SYS ON	3	5 V=TX ON; 0 V= TX OFF;
TP23	EQUIP	4	5 V=TX ON; 0 V=TX OFF; Equipment Interlock from Remote I/O (Backup Control Only)
TP24	ON/OFF	4	5 V=TX ON; 0 V=TX OFF (Backup Control Only)
TP21	RESTRIKE	4	5 V=Restrike
TP37	ON	4	0 V=TX ON; 5 V=TX OFF
TP41	OFF	4	0 V=TX OFF; 5 V=TX ON
TP15	FAULT OFF	4	0 V=Fault OFF Turns TX OFF
TP33	HW CTRL	4	5 VDC=Hardware control; 0 VDC=Software control
TP25	/RF MUTE	4	0 V=RF Muted; 5 V=RF un-muted
TP42	APC	4	2.7 VDC Typical at calibrated power. APC to Exciter (Exciter will be slightly lower (≈0.1 V) due to cable drop)
TP17	FWD_PWR_AN	5	3.5 VDC Typically at Calibrated power; Forward power sample from detector circuit to APC
TP20	APC Response	5	Same as FWD_PWR_AN has voltage follower inbetween
TP5	REF IN	5	3.5 VDC typically at calibrated power; APC Reference from Micro
TP10	BYPASS POWER CONTROL	5	3.5 VDC if R7 set to calibrated power in backup mode; APC Reference when in Backup Control (Lifesupport) Set by R7
TP19	POWER REF	5	3.5 VDC Typically; APC Drive Voltage
TP7	ANALOG PA	5	3.5 VDC Typically at calibrated power; APC voltage to IPA (When APC is driving IPA instaed of exciter, ie Micromax)
TP32	PA MODE	5	5 V=Class AB; 0 v= Class C
TP18	PS Control	5	Class C=0.6 VDC; Class AB=1.1 VDC
TP1	FWD PWR DETECTOR	6	Voltage transmitter depedant; Forward power detector voltage output
TP12	FWD PWR OUT	6	Voltage transmitter depedant; FWD_PWR_AN Reference that drives APC from detector
TP9	REFLD POWER DETECTOR	6	Voltage transmitter depedant; Reflected power detector voltage output
TP8	REFL POWER OUT	6	Voltage transmitter depedant; REFLD_PWR_AN to VSWR protectin circuitry
TP2	POWER LIMIT	7	0.5 VDC at calibrated power; Increases (≈1.75 VDC) to limit APC rise
TP34	+5V POWER SUPPLY	9	Typically 4.79 VDC
TP3	-5V POWER SUPPLY	9	Typically -4.68 VDC
TP30	REFLECTED POWER METER	11	Voltage proprtional to Reflected Power; Mux'd reading will not be constant
TP26	VOLTAGE METER	11	Voltage proprtional to PS Voltage; Mux'd reading will not be constant
TP27	CURRENT METER	11	Voltage proprtional to Module Current; Mux'd reading will not be constant
TP36	COOLING/CONTROL METER	11	Voltage proportional to Temp and Airflow;Mux'd reading will not be constant
TP40	FORWARD POWER METER	11	Voltage proprtional to Forward Power; Mux'd reading will not be constant
TP39	REFLECTED POWER FAULT	11	Low unless Reflected Power Fault in System; Mux'd reading will not be constant
TP28	VOLTAGE FAULT	11	Low unless Voltage Fault in System; Mux'd reading will not be constant
TP31	CURRENT FAULT	11	Low unless Current Fault in System; Mux'd reading will not be constant
TP14	VREF	13	4.096 VDC
TP13	FWD REF	13	4.096 VDC
TP6	REFLD REF	13	4.096 VDC
TP38	GROUND	13	
TP4	GROUND	13	

FAX Control Board Functions

Fan Control Board

Monitors up to 4 fans

Controls the speed of the fans – all fans run at the same speed

Provides temperature sensor for Reject Loads

Provides RF detection for Reject Loads

Provides Fan Faults – 1 Fault for all fans – Each fan has fault LED on board

Cabinet Interface Board

Interfaces cabinets in FAX30/40 only – System Bus, Interlock, etc

Monitors the reject loads when combining cabinets

Power Supply Interface Board

Monitors AC line for under-voltage, there is no over-voltage or phase monitor

Power supply faults and voltage are multiplexed through board

Airflow sensor on board

Rear power block temperature measured

Power block fan faults are multiplexed through board

Power Supply Interface LED Definitions

LED	Name	Sheet	Description
DS1	AC INLOW 1	2	AC mains low monitor ON=AC Fault on Phase 1
DS2	AC INLOW 2	3	AC mains low monitor ON=AC Fault on Phase 2
DS3	AC INLOW 3	4	AC mains low monitor ON=AC Fault on Phase 3
DS4	POWER SUPPLY FAULT	5	Indicates Power supply fault, AC Mains Low fault or PS is not inserted
DS5	FLOW FAULT	6	Indicates Airflow has dropped below XX % of calibrated 100 % level
DS6	FAN FAULT	6	Indicates one or more fans have failed

Power Supply Interface Test Point Definitions

Point	Name	Sheet	Description
TP1	PS_ADJ	7	Power Supply Adjust voltage to the MARGIN Pin on Power Supply
TP2	4.096 REF	8	4.096 V Reference Voltage used on board
TP3	+5 V EXT	8	Main 5 V that feeds System Interface
TP4	TEMP	7	Voltage proportional to the temp feed Mux Bus
TP5	AIRFLOW	6	Airflow Monitor Voltage feeds Mux Bus
TP6	FAN TEMP	7	Voltage to Fan monitor board to control speed of fans
TP7	+5V	8	+5 V Bus
TP8	GROUND	8	
TP9	GROUND	8	

Fan Board LED Definitions

LED	Name	Sheet	Description
DS1	FAN1 FAULT	2	ON=FAN 1 TACH has tripped fault
DS2	FAN2 FAULT	2	ON=FAN 2 TACH has tripped fault
DS3	FAN3 FAULT	2	ON=FAN 3 TACH has tripped fault
DS4	FAN4 FAULT	2	ON=FAN 4 TACH has tripped fault
DS5	TEMP FAULT	3	Reject Load temp has increased to a level that will drive fan speed up
DS6	RF LEVEL	4	Indicates RF level into reject load has increased to a level that will drive fan speed up
DS11	FAN1 FAULT	2	ON=FAN 1 TACH has tripped fault (Led can be seen with front door open)
DS12	FAN2 FAULT	2	ON=FAN 2 TACH has tripped fault (Led can be seen with front door open)
DS13	FAN3 FAULT	2	ON=FAN 3 TACH has tripped fault (Led can be seen with front door open)
DS14	FAN4 FAULT	2	ON=FAN 4 TACH has tripped fault (Led can be seen with front door open)

Fan Board Test Point Definitions

Point	Name	Sheet	Description
TP1	RF LEVEL	4	DC voltage from reject load RF sample detector, feeds back to speed control circuit
TP2	SPEED CONTROL	3	Voltage from all sources (on-board and external to board) that drive the speed control gain amp
TP3	TEMP	3	Voltage proportional to Temp feeds speed control circuit
TP4	SPEED OUT	3	Speed control voltage that drives the fan
TP5	DRIVE	3	Drive from gain amp to speed control will differ depending on a tx control or reject load fan control
TP6	CLOCK	3	Clock that feed Speed control timer

Cabinet Interface Board LED Definitions

LED	Name	Sheet	Description
DS1	MUX ENABLED	3	Indicates the MUX Bus is enabled
DS2	+5 V	3	+5 V
DS3	PRIMARY REJECT FAULT	3	Primary Reject Load is faulted
DS4	SECONDARY REJECT FAULT	3	Secondary Reject load is faulted

Cabinet Interface Board Test Point Definitions

Point	Name	Sheet	Description
TP1	PRI REJECT	4	DC voltage from reject load RF sample detector, feeds back to speed control circuit
TP2	REJECT SAMPLE MUX	3	Voltage from all sources (on-board and external to board) that drive the speed control gain amp
TP3	REJECT FAULT MUX	3	Voltage proportional to Temp feeds speed control circuit
TP4	SEC REJECT	3	Speed control voltage that drives the fan
TP5	GROUND	3	Drive from gain amp to speed control will differ depending on a tx control or reject load fan control
TP6	COL 3	2	Clock that feed Speed control timer
TP7	MUX ENABLE	2	
TP8	ROW 3	2	
TP9	+5 V	3	
TP10	GROUND	3	

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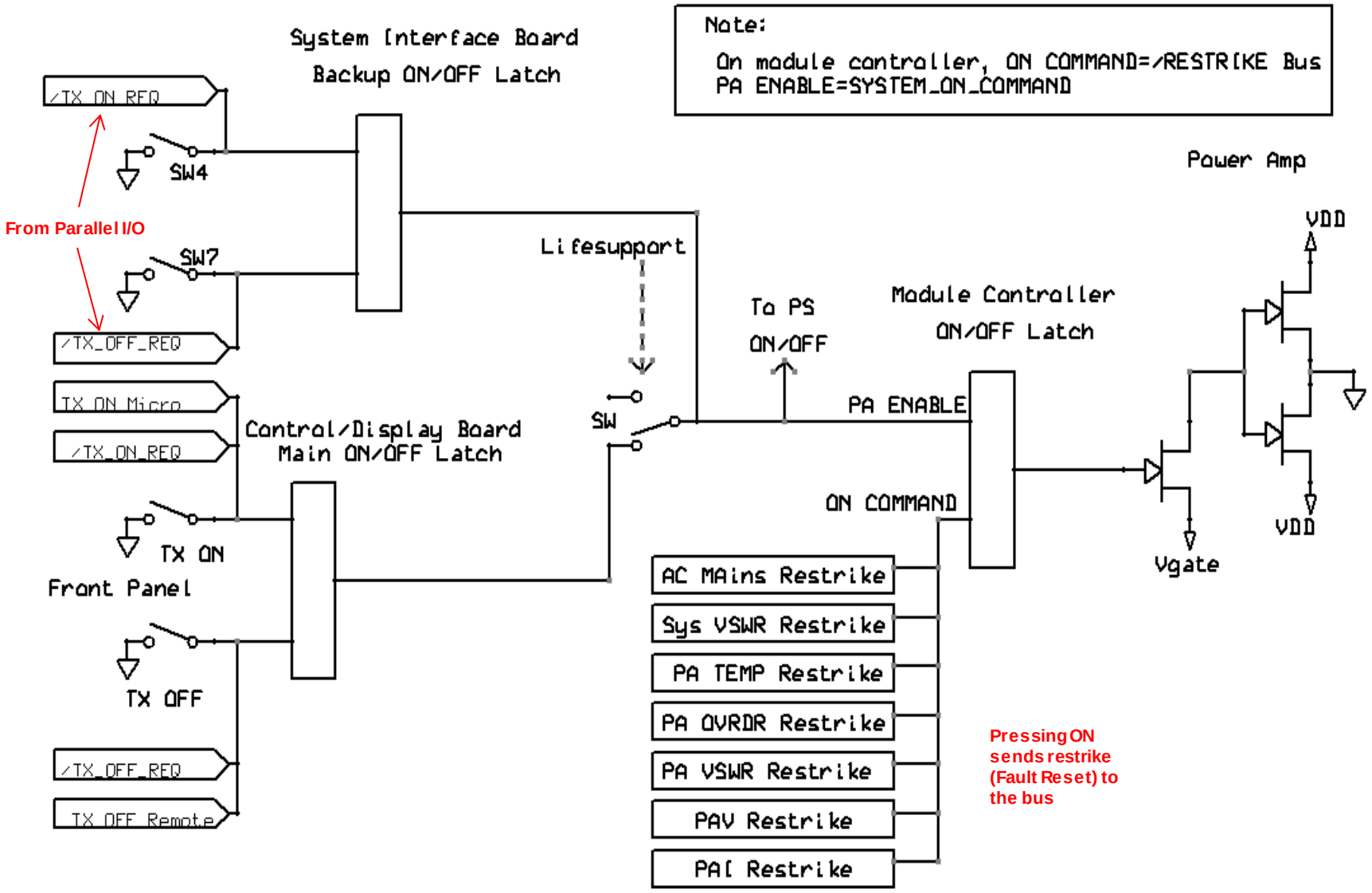
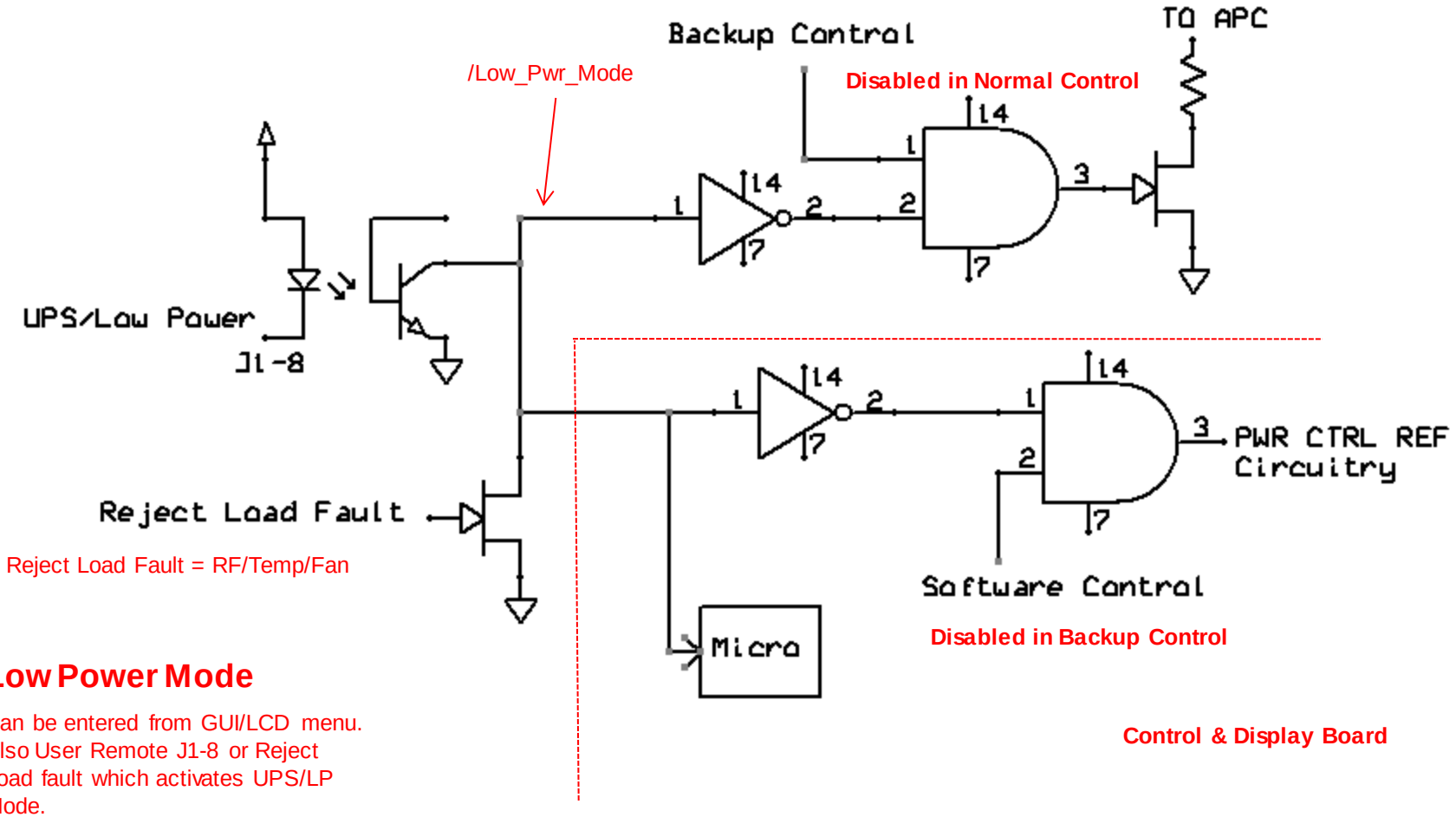




Low Power Mode

Can be entered from GUI/LCD menu. Also User Remote J1-8 or Reject Load fault which activates UPS/LP Mode.

Parallel I/O Status Outputs on User Remote J1 (System Interface Rev J and earlier hardware)

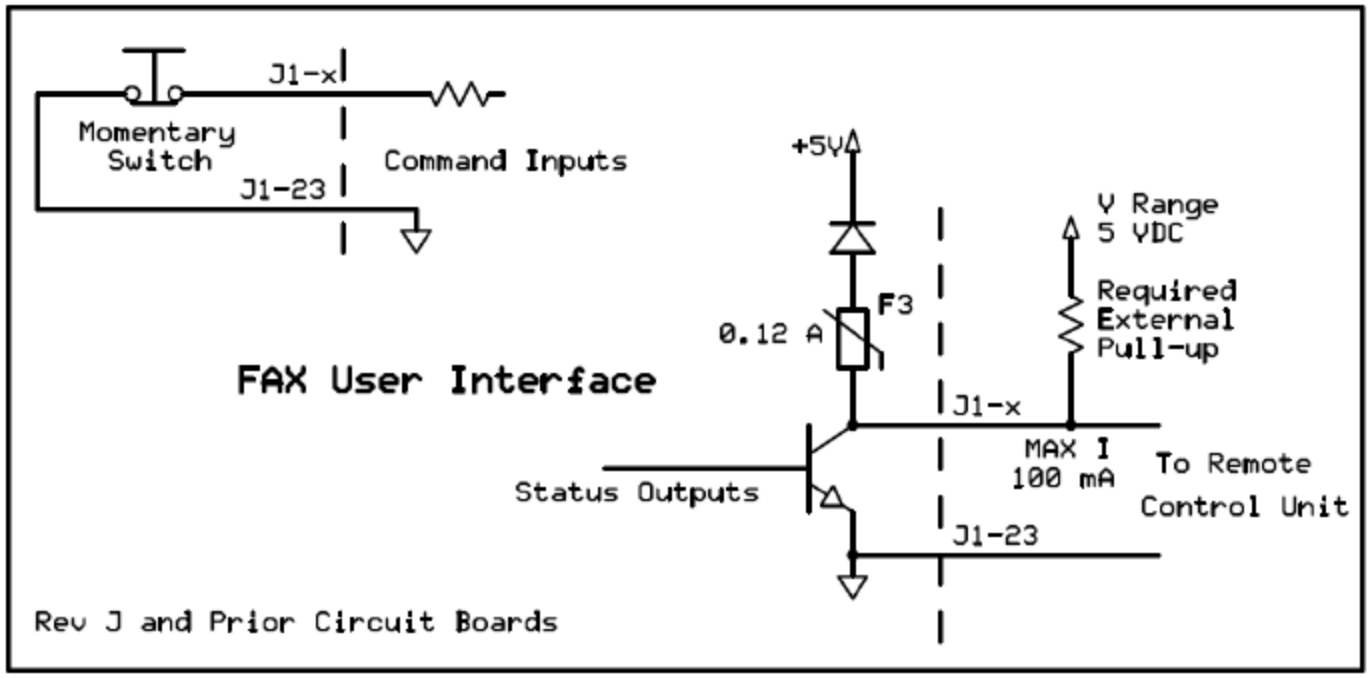


Figure 2-12 User Remote Inputs and Outputs Rev J and earlier boards

Parallel I/O Status Outputs on User Remote J1 – (Sytem Interface Rev K and Later Hardware)

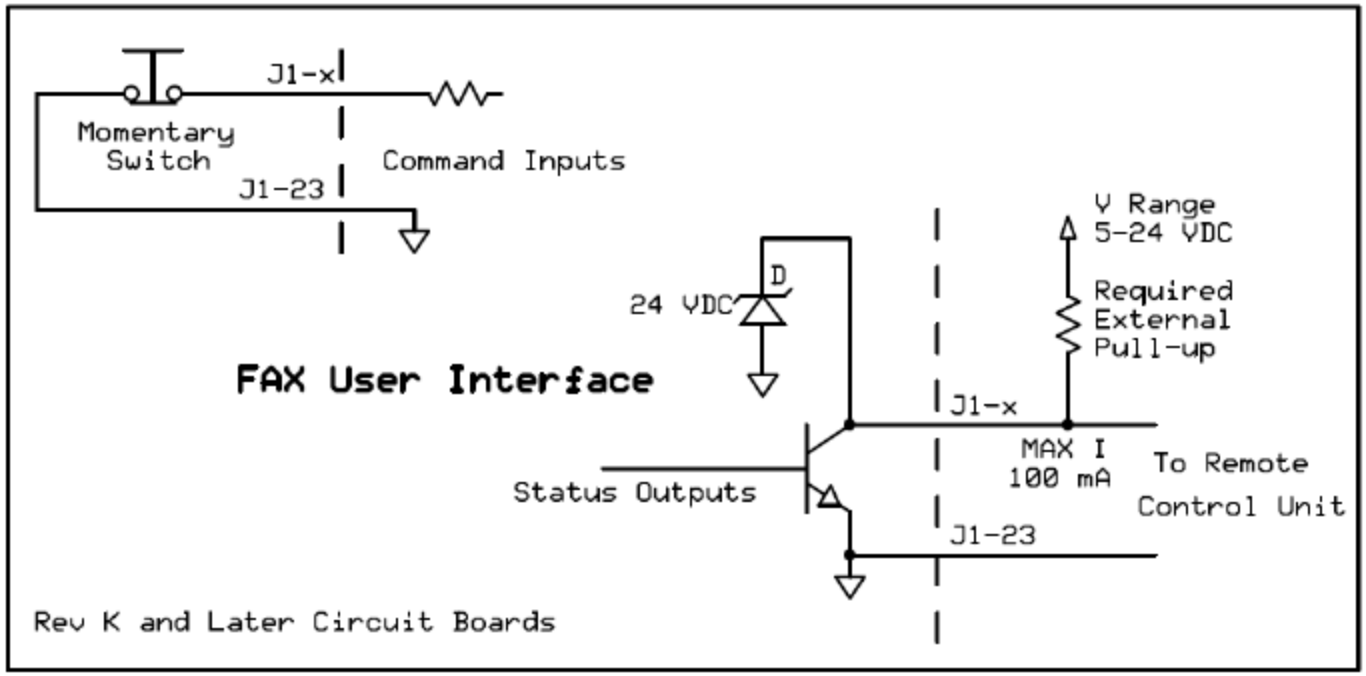
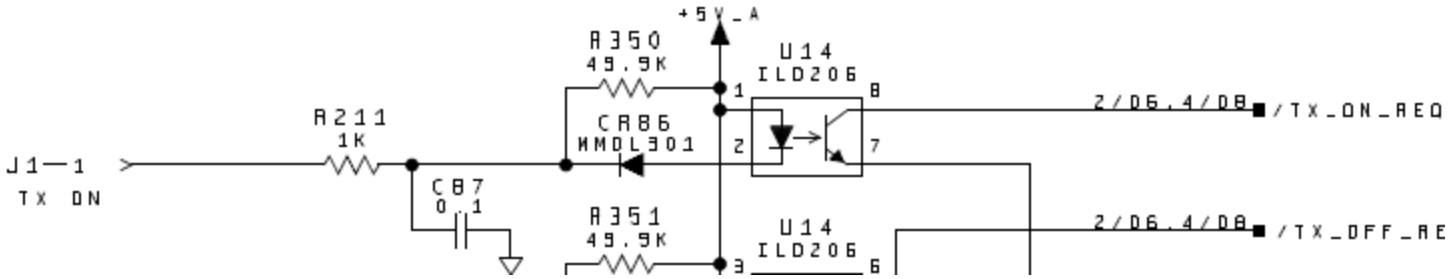


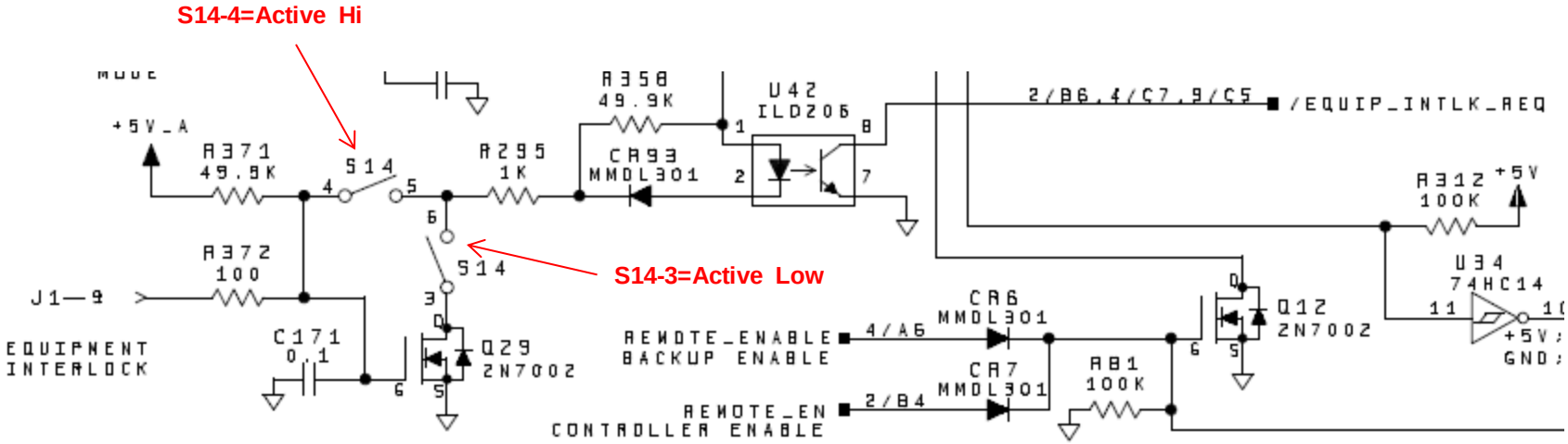
Figure 2-13 User Remote Inputs and Outputs Rev K and Later boards

Parallel I/O Inputs User Remote J1



To Remote Enable

Equipment Interlock on User Remote J1



Equipment Interlock can be set Active Hi or Low depending on S14-3,4 settings.

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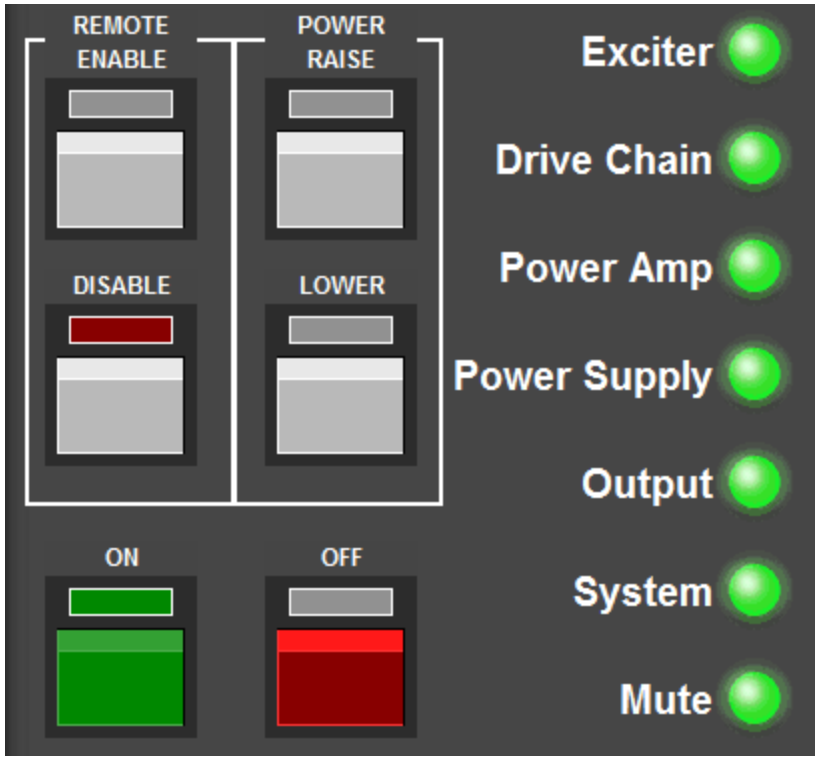

Exciter LED - /EXCITER_FAULT from exciter to System Interface board. On system interface this signal is summed to the Remote Status Outputs (Sheet10) Summary Fault, lights EXCITER-SUM-FAULT DS31 (Sheet 3) and goes to Control/Display Board via System Bus to Micro Module
Green=Exciters Normal
Red=Exciter Faulted
Amber=Exciter Switch has tripped (Dual Exciters)

Drive Chain LED - /DRIVE_CHAIN_FAULT From IPA Module via Backplane Board and Power Supply Interface Board to System Interface Board where it is summed to the Remote Status Outputs (Sheet10) Summary Fault, lights DRIVE-CHAIN-SUM-FAULT DS30 (Sheet 3), and goes to Control/Display Board via System Bus to Micro Module. On the Backplane Board in the IPA slot S1 Section 7 should be on (IPA Slot ONLY) which routes PA Summary Fault to Drive Chain Fault.

Green=Drive Chain Normal
Red=Drive Chain Faulted
Amber =Drive Chain Switch has tripped

The following can trip Drive Chain Fault:

Module Thermistor – trips between 91 - 101˚ C

Module Reflected power – 100 W Max

Module Input Power – 25 W Max FM Mode

Module Current – trip level 30 Amp

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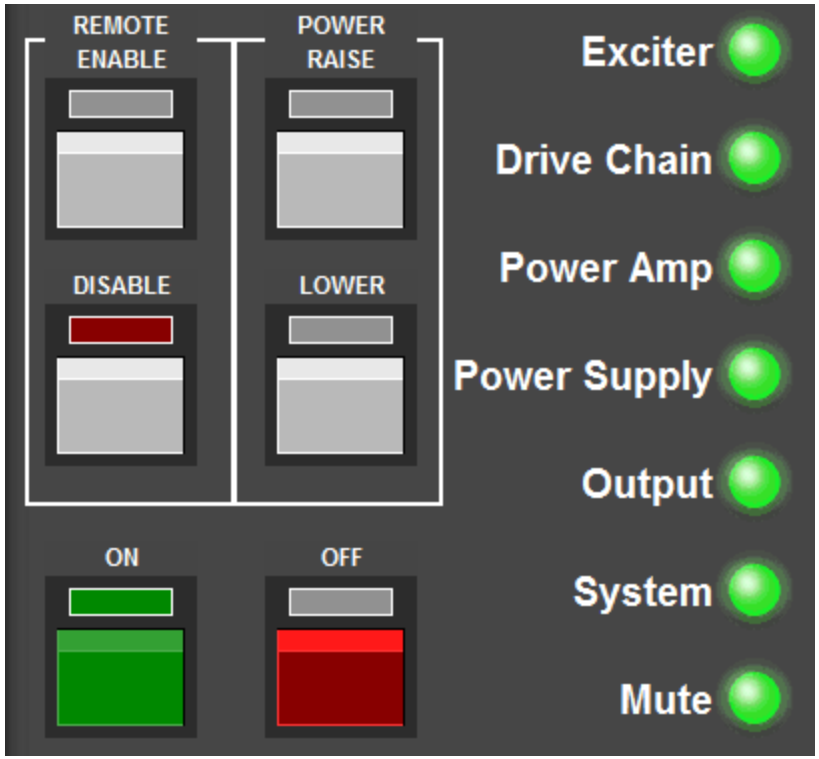

Power Amp LED - /PA_SUM_FAULT From PA Module via Backplane Board and Power Supply Interface Board to System Interface Board where it is summed to the Remote Status Outputs (Sheet10) Summary Fault, lights /PA_SUM_FAULT DS32 (Sheet 10), and goes to Control/Display Board via System Bus to Micro Module. In present software this fault also disables APC on System Interface Board Sheet 6 B8.

Green=All PA's Normal
Red=one or more PA's are Faulted

The following can trip PA Summary Fault:

Thermistor – trips between 91 - 101° C

Module Reflected power – 90 – 200 W Max

Input Power – 25 W Max

PA Current – trip at 30 Amp

Power Supply LED - /PS_SUM_FAULT From Power Supply Module via Power Supply Interface Board to System Interface Board where it is summed to the Remote Status Outputs (Sheet10) Summary Fault, lights PS-SUM-FAULT DS29 (Sheet 3), and goes to Control/Display Board via System Bus to Micro Module. This fault also disables APC on System Interface Board Sheet 6 B8.

Green=Power Supplies and AC Mains Normal
Red= one or more Power Supply Faults or AC Mains has dropped below 190 VAC or lost a phase

The following can trip PS Summary Fault:

AC Mains Fault - <≈190 VAC

Fault in main power supplies

Power Supply Removed

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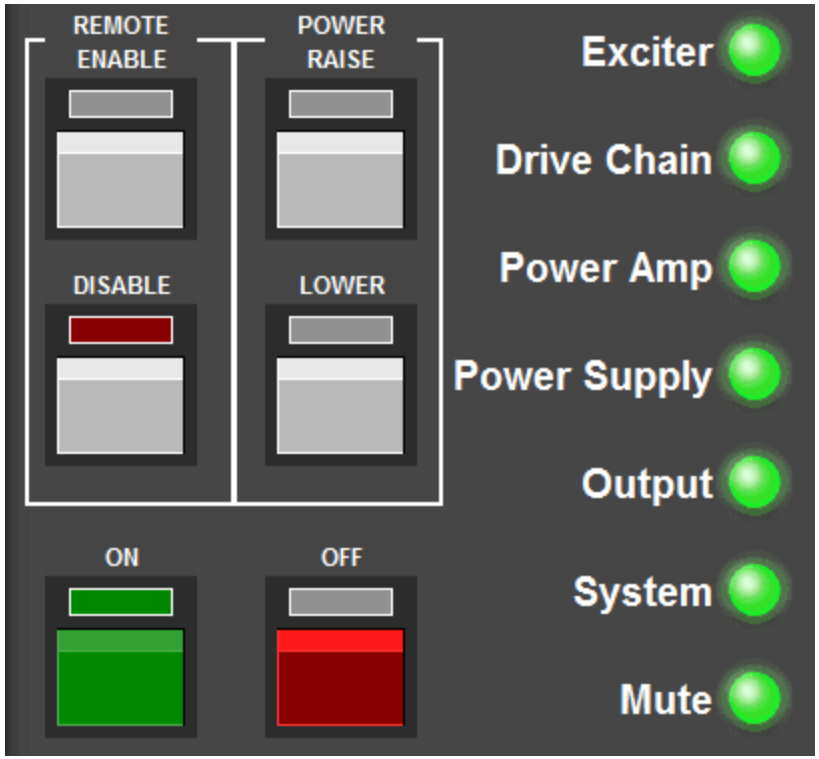


System LED Control Warnings

Power Mode	Fan Fault
APC OFF	Airflow
Power Limit	
RF Mute	
Remote Mute	
Interlocks	
Backup Control	

Output LED - /OUTPUT_SUM_FAULT From System Interface Board to Control/Display Board via System Bus to Micro Module. Also lights DS33 on System Interface (Sheet 10)

Green=Normal
OFF=TX OFF
Amber= Forward power below warning threshold
Red=VSWR Fault, Forward power below fault threshold or Combiner Temp Fault

The following can trip Output Fault (System Interface)

Low forward power - <90 % TPO (Sheet 7)

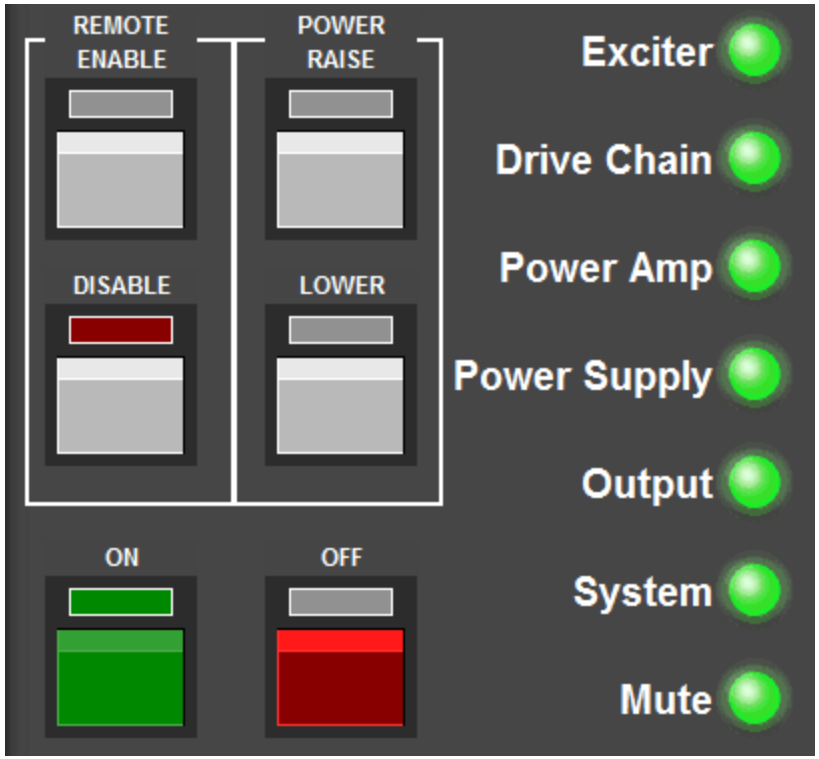
High VSWR - >1.3:1 to 1.5:1 (User Setting) (Sheet 7)

Reject Load Fault (Sheet 9)

System LED - /SYSTEM_SUM_FAULT From System Interface Board to Control Display Board via System Bus to Micro Module. Lights DS28 (Sheet 3), summed to the Remote Summary Fault (Sheet 10)

Green=System Normal
Red=System Fault (Control or Cooling); Software Control Disabled
Amber=System Warning

Flexiva™ FAX Series



Mute LED - /RF_MUTE To Exciter from System Interface Board and Control/Display Board via System Bus to Micro Module. There is a 1 Second ramp-up circuit (R276/C26) on un-mute Sheet 5 System Interface Board. Lights DS22 RF MUTE BUS LED (Sheet 9)

Green=TX OFF or TX ON and Un-Muted

Red=TX ON and System is Muted

The following can mute the transmitter:

TX OFF command (Sheet 4)

Drive Chain Switching (Sheet 4)

VSWR Trip (Sheet 7)

Exciter Ready Line (Sheet 8)

RF Mute Request from Remote I/O (Sheet 10)

Equipment Interlock unsatisfied on Remote I/O (Sheet 10)