SCHEMATICS and FAULT CODES



ELECTRICAL INSTALLATIONS and Wiring Schematics BCT Commercial Tower Dryer

BCT 2500 - BCT 10000





For Intui-DRY® Controller Alarms/Levels/Color Codes, and FAULT CODES displayed on the Intui-DRY screen, refer to: MFH2191, Intui-DRY® Controller Manual or MFH1944, BCT Owner/Operator Manual.

SAFE Electrical Installations

SAFETY First!

This symbol is used throughout this Manual to identify particular stages where the bin Contractor and/or Operator need to take special note and precautions regarding the danger described in these instructions. Please read all the SAFETY information and the instructions completely prior to beginning the construction.



Recognize and Understand SAFETY Information

This is the Safety-Alert Symbol. When you see this symbol on your equipment or in this Manual, be alert to the potential for **personal injury**. It may be used alone or in conjunction with a **signal word**. Signal words **DANGER**, **WARNING**, or **CAUTION**, are used with the Safety-Alert Symbol. Be sure to follow ALL national, state and local safety standards governing each installation site.

Symbol+Signal Word	Description
A DANGER	DANGER is a signal word that indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.
A WARNING	WARNING is a signal word that indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
A CAUTION	CAUTION is a signal word that indicates a hazardous situation which, if not avoided, MAY result in minor or moderate injury.
	IMPORTANT indicates vital information or instructions, highly recommended and/or pertinent, for the safe installation or operation of your equipment. It may have a pictogram to indicate mandatory equipment (i.e., PPE) or action (i.e., grounding, read the manual).
\bigcirc	This is the International PROHIBITION Sign, or NO Sign, which indicates something (i.e. smoking) is not permitted.
\bigtriangleup	This internationally recognized HAZARD symbol is customized with a pictogram showing the general type of DANGER.
NOTICE:	NOTICE (white italic letters on a blue header) is used to address practices or steps not related to physical injury.
SAFETY INSTRUCTIONS	INSTRUCTIONS related to safety and/or operation procedures may be on decals with a green header. They may refer to this manual.



Electricity can KILL! All electrical installations and testing MUST be done by a QUALIFIED and properly certified/licensed ELECTRICIAN, in accordance with all applicable national, state/provincial and local codes. Brock Grain Systems neither will be liable for damage to the Dryer or to person(s) because of unqualified electrical testing, installation or use. Improper procedures will void the Warranty. Failure to follow these instructions will create an imminently hazardous situation which, if not avoided, will result in serious injury that could lead to death. See the chapter on Electrical Installations.

IMPORTANT!



It is the responsibility of the Contractor, Installer, Owner and Operator to supplement the Dryer furnished by Brock Grain Systems with any necessary ELECTRICAL or STRUCTURAL items to make the Dryer installation comply with the <u>National Electric Code</u>, <u>National Electric Safety Code</u>, and OSHA (U.S.); the <u>Canadian Electrical Code</u> (Canada); and any other applicable federal, state and local laws and ordinances.

Qualified Electrical Personnel ONLY!

Procedures in this Manual are intended for use by qualified electricians ONLY!

Failure by qualified electrical installers to read and/or understand the contents of this Manual, and/or the failure to follow proper procedures outlined in this Manual—BEFORE Dryer testing and startup—constitutes a misuse of the equipment and an unsafe situation that could result in death or serious injury, and/or could damage the equipment and void the Warranty.

This Manual contains diagrams and basic steps to provide the qualified electrical Installer with information for a safe installation. Due to the customized design of the BROCK® Commercial Tower Dryer (BCT), some electrical installation remains at the Installer's discretion according to all applicable federal, provincial/state and local laws and codes. Follow recommended precautions and safe operating practices of national and local codes at each installation site.



It is the responsibility of the Contractor, Installer, Owner and Operator to supplement the Dryer furnished by Brock Grain Systems with any necessary ELECTRICAL or STRUCTURAL items to make the Dryer installation comply with the <u>National Electric Code</u>, <u>National Electric Safety Code</u>, and OSHA (U.S.); the <u>Canadian Electrical Code</u> (Canada); and any other applicable federal, state and local laws and ordinances.

Always use **properly rated/insulated PPE equipment** when working near sources of electricity and other hazards.

Installation is not complete until a SAFETY Systems checkout is run to see that all SAFETY systems are in working order. This must be done before initial startup. It should also be done at the beginning of each season, and any components replaced if necessary.

TrueGrain[™] Moisture Sensor System (Now Standard on BCT Dryers)

This NEW system (Patent Pending), is shipped loose with new Dryer installations.

It is mounted under the primary Grain Discharge.

All updated schematics incorporate the TrueGrainTM Moisture System into their design.

Appendix G in THIS Manual shows a simple diagram to physically connect TrueGrainTM wiring to the red Control Panel.

Refer also to the TrueGrainTM Installation/ Owners Manual MFH2228 (right) for additional information.



Manual MFH2228

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Electrical Installations and SAFETY



Electricity can kill! All electrical installation and testing MUST be done by a QUALIFIED and properly certified/licensed ELECTRICIAN, in accordance with all applicable national, state/provincial and local codes. Brock Grain Systems neither will be liable for damage to the Dryer/Controller or to person(s) because of unqualified electrical testing, installation or use. Improper procedures will void the Warranty. Failure to follow these instructions will create an imminently hazardous situation which, if not avoided, will result in serious injury that could lead to death.





INCLUSION in this Manual of any electrical procedures and/or safety reminders for SERVICE of equipment—is a precaution by the Manufacturer to help insure that safety requirements are met both for the country of manufacture and the countries of usage.

INCLUSION of such technical procedures—outside the normal OPERATION of this equipment by a trained USER—does NOT in any way imply that these procedures are to be used BY unqualified personnel or in substitution FOR qualified electrical or service personnel.

Do not install or use any method to start or restart the Dryer which bypasses factoryinstalled SAFETY features.



Your Dryer has pre-wired Hi-Limit Sensors. This is a SAFETY feature that will sense dangerously high temperatures and/or in case of failure, alert the Intui-DRY® Controller and Operator to shut down the Dryer. Do NOT make any modifications to bypass these features. If this instruction is not followed, an unsafe situation is created that will result in extreme danger to life and property if the Dryer is operated. Such modifications could create a potentially hazardous situation which, if not avoided, could cause serious injury that could lead to death. Such modifications could void the Warranty.

- **Tower Linear Limit** system: Exhaust air temperature is monitored with thermostats around the outer circumference of the Tower.
- Low-Profile Linear Limit system: Exhaust air temperature is monitored with thermostats that run the length of the Dryer on both sides.

These thermostats are set to trip at 210° F [98.88°C] which will shut down the Dryer and activate the alarm. No part of the Linear Limit circuit is to be removed or modified in any way.

In the event these components need replacement or repair, contact Brock Grain Systems at 1-800-541-7900.

BCT Wiring Requirements



A DANGER

Incoming Power Service Requirements and the Service Disconnect (Customer-Provided)

The Customer must supply appropriate Disconnect equipment between the Dryer Equipment Disconnect and the electrical utility as required by all applicable national, state/provincial, local and electrical codes.

Plan the power requirements and any needs for reduced voltage starting with your local electrical service supplier. See notes on the **Dryer Specifications Plate** inside the Red Control Cabinet; and see **Specifications Tables** on pages 35-37.

The Installer should have the Electrical Service Provider check the transformer and lead wires to be sure they are an adequate gauge to carry the starting and full-load operating conditions. Failure to follow these instructions will create an imminently hazardous situation which, if not avoided, will result in serious injury that could lead to death.

The **Service Disconnect** turns power ON/OFF from the power service provider. It should be located away from livestock but as conveniently as possible for the Dryer Operator, especially in case of emergency. It may be located separately from the Dryer in an electrical room/area on the facility. The area must remain unobstructed and must be clearly marked as to its function. The Service Disconnect MAY be located near the electrical Control area at the Dryer pad. Ideally, the Operator should be able to view the entire Dryer from this location.



The Service Disconnect should be provided with a STOP button and LOCKOUT/TAGOUT (LOTO) features. Depending on local codes, it is the responsibility of the Service Provider and/or Owner to clearly mark the Service Disconnect and apply SAFETY Decals for HIGH VOLTAGE DANGERS within.



GROUND the Power Service Disconnect



To guard against electrical shock, it is imperative that the POWER SERVICE DISCONNECT have its own ground wire from the main three-phase power coming into the BROCK® <u>Power</u> Panel Cabinet. If the main electrical service is a 3-wire non-grounded Delta supply, consult a qualified electrician for installation.



Electricity can KILL! Use extreme CAUTION around electrical components discussed/ shown on these pages. SHUT OFF, LOCKOUT and TAGOUT electrical power BEFORE opening and servicing any internal components in these Electrical Cabinets. All electrical testing and service on this equipment must be done by a QUALIFIED ELECTRICIAN, in accordance with all national, state, and local electrical SAFETY codes. Keep Cabinet Doors CLOSED during Dryer operation. Failure to follow these instructions will create an imminently hazardous situation which, if not avoided, will result in serious injury that could lead to death. Brock Grain Systems neither will be liable for damage to the Dryer or to person(s) because of unqualified electrical testing or use. Improper testing or use will void the Warranty.





Wiring Requirements

A LOCKOUT/TAGOUT device/lockable disconnect switch MUST be installed on Dryer Control enclosures containing hazardous voltage wiring to prevent the Dryer from restarting during a safety check, maintenance, etc. All electrical equipment must be grounded.

Refer to the **Specifications and Capacities Tables** on pages 35-37 for the maximum unload rate of the model Dryer to be installed.

Use extreme CAUTION around electrical components. Be sure wires are an adequate gauge to carry the load of the Dryer motors, including starting and full load operating conditions. Failure to follow these instructions will result in death or serious injury.

- 1. Ensure that the Dryer is properly grounded with a Ground Rod, located and connected as close to the Dryer frame as possible. If this is not done, the Moisture Sensor readings may fluctuate up and down. For ground rod installation, see pages 33-34.
- 2. Verify all solid conductor ground wires inside the red Control Cabinet are present and tight. If they are not, Moisture Sensor readings may fluctuate up and down.
- 3. Verify that all GROUND and NEU wires inside the Dryer/Equipment Disconnect Cabinet and/or Power Cabinet are present and tight. If they are not, the Moisture Sensor readings will fluctuate up and down.
- 4. If a Soft Start is used, a # 8 solid copper ground wire must be connected from the mounting Backplate of the Soft Start to the mounting back plate of the Control Cabinet.
- 5. Ensure the Moisture Sensor ground wires are present and securely bonded from the sensor cover plate to the Dryer chassis ground.



To guard against electrical shock, all Dryers must have a GROUND connection. Make sure electrical equipment and the Dryer are properly installed and GROUNDED by a QUALIFIED ELECTRICIAN according to the <u>National</u> <u>Electrical Code</u> and all applicable state and local codes.

Install Interlocked Emergency Shut-Off Devices





It is the responsibility of the Contractor, Installer, Owner and Operator to supplement the Dryer furnished by Brock Grain Systems with any necessary ELECTRICAL or STRUCTURAL items to make the Dryer installation comply with the <u>National Electric Code</u>, <u>National Electric Safety Code</u>, and OSHA (U.S.); the <u>Canadian Electrical Code</u> (Canada); and any other applicable federal, state and local laws and ordinances.

In selecting electrical CONTROL equipment to be used with any installation, the purchaser must use equipment conforming to all the above Codes and all other applicable local or national codes or regulations.

The Electrical Schematics in this Manual show how the various controls are interlocked and allow a qualified electrician to quickly troubleshoot electrical problems or malfunctions. Keep the Schematics in a handy place for future reference.



All SAFETY devices, including wiring of electrical devices, shall be arranged to operate in a "FAIL-SAFE" manner. That is, if a power failure or failure of the device occurs, a HAZARDOUS CONDITION will not result. To prevent a hazardous condition, the machine and all associated equipment MUST BE PREVENTED FROM RESTARTING on its own when power returns after a power failure or a jam is cleared. A MANUAL re-start must be required. Failure to follow this instruction could cause death or serious injury.

Therefore the Contractor/Installer must not take any action that circumvents these Dryer features that prevent hazardous conditions. Do not install or use any method to start or restart the Dryer which bypasses factory-installed SAFETY features.

Unload Controls shall be so arranged that, in the case of an emergency stop, a manual reset or start—at the location where the emergency stop initiated—shall be required for the Unload and associated equipment to resume operation.

Mount Controls at a convenient place, which is a safe distance from the machine. Make sure Controls are readily accessible in the event of an emergency. It is strongly recommended that another qualified person who knows the shutdown procedure is in the area in the event of an emergency.

Brock Grain Systems strongly recommends installation of the following devices with the Unload:

- **Overload protection devices** such as shear pins, torque limiters, zero speed switches, etc., to shut off, **LOCKOUT and TAGOUT** power to the Drive whenever operation of equipment is stopped (as a result of excessive Grain, foreign objects, excessively large lumps, etc). Motor overload protection and over-current protection are not supplied with the equipment.
- **Emergency STOP switches** readily accessible wherever required; Dryers should be furnished with an easily identifiable EMERGENCY STOP button or an EMERGENCY STOP device. Such devices should be installed so they cannot be overridden from other locations.
- Electrical interlocking to shut down the feeding auger whenever a receiving auger stops;
- **Signal devices** to warn personnel of possible startup of the auger, especially if started from another location.

SAFETY During Initial Startup or Testing



If an energized power panel is to be opened during initial startup or testing, a 10' [3.048] SAFETY perimeter should be blocked off with a non-conductive guard. When instructions call for or when service requires live panel testing or troubleshooting, it should only be done by qualified electricians using appropriate PPE and extreme CAUTION.

Do Not Modify Dryer Wiring to Bypass SAFETY Features!



The Dryer Installer has wired-in Hi-Limit Sensors. This is a SAFETY feature that will sense dangerously high temperatures and/or in case of failure, alert the Intui-DRY® Controller to shut down the Dryer. Do NOT make any modifications to these features. If this instruction is not followed, an unsafe situation is created that will result in extreme danger to life and property if the Dryer is operated.

Linear Limit System

Exhaust air temperature is monitored with thermostats around the outer circumference of the Tower. These thermostats are set to trip at 210°F [98.88°C] which will shut down the Dryer and activate an Alarm (see Operator Manual MFH1944 or the Intui-DRY® Manual MFH2191).

Operating temperatures are monitored with copper wires (around the circumference of the Tower) in upper and lower locations around inside walls (Screens) and outside walls of the Tower (see Tower lower left). On the outside they are protected under Flashing at each Catwalk height. On the inside they are mounted to C-Channels.



These Linear Limits sense any temperature variation outside an acceptable range, tripping the Linear Limit switch, and setting off alarms.

No part of the Linear Limit circuit is to be removed or modified in any way.

In the event these components need replacement or repair, contact Brock Grain Systems at 1-800-541-7900.



DETAIL





Figure 3. Linear Limit System

Item	Description
1	Operating Temperature RTD
3	High Limit Sensor
5	UV Scanner (mini peeper)
6	Burner



DO NOT RUSH the Dryer in times of high humidity and wet grain by running the Burners too high in an attempt to dry the grain faster! Do not exceed maximum temperatures recommended by the Manufacturer.



The Tower Junction Box location Decal (below) will be on the back plate of the Red Control Cabinet.



Figure 5. Linear Limit Location Reference Decal

Error Codes Indicate Linear Limit Trips

Locate the right side of the Safety Board inside the red Control Cabinet. An LED light will be lit when the Linear Limit Switch circuit is CLOSED and voltage applied. An OPEN Switch will present <u>no</u> LED light. The LED light is positioned across from corresponding switch wiring on the terminal strip.



Figure 6. Internal Linear Limit Switch Terminal Strip with LEDs to Indicate Troubled Box



Reminder: All electrical installation and testing MUST be done by a QUALIFIED and properly certified/licensed ELECTRICIAN, in accordance with all applicable national, state and local codes. Brock Grain Systems neither will be liable for damage to the Dryer/Controller or to person(s) because of unqualified electrical testing, installation or use. Improper procedures will void the Warranty.

Failure to follow these instructions will result in death or serious injury.

If the Dryer is to be opened for inspection, cleaning or observation, all power must first be shut off. SHUT OFF, LOCKOUT and TAGOUT all electrical power BEFORE working on or near the Dryer so that it CANNOT be restarted by anyone remote from the area. DO NOT allow the Dryer to run while any adjustments are made. Do not adjust, service, lubricate, clean, unclog or enter this equipment while in operation. Failure to SHUT OFF and LOCK OUT power will lead to personal injury or death. Brock Grain Systems will not be liable for the electrical wiring used with this Dryer or Dryer Controller or failure of equipment due to improper electrical installation.

Auxiliary Load and Unload Wiring

Location of Power Cabinet/Dryer Disconnect and Adjacent Control Cabinet

Control locations should be planned in detail with your Installer before constructing the Dryer. The **Electrical Power Cabinet/Dryer Disconnect** and the **Red Control Cabinet** are typically positioned next to each other at various locations around the Dryer base. Consideration should be given to conveyor paths, fuel train, electrical power source, and Control wiring in locating these two large boxes. Consult your Installer if alternative locations are desired.

Motor Wiring in the AC Drive Enclosure



It is very important with an AC Drive to WAIT for capacitors to discharge stored electrical energy BEFORE any service is begun on the Drive. If a capacitor explodes, there will be a shotgun-like blast. The danger of a capacitor explosion is similar to that of an arc flash. The Drive Manufacturer recommends WAITING at least fifteen (15) minutes for the energy to dissipate from the capacitors. VERIFY THAT NO VOLTAGE IS PRESENT before proceeding. Failure to observe this instruction will result in potentially hazardous situation which, if not avoided, could cause serious injury that could lead to death. Obey all Safety Decals on this Cabinet. Qualified electrical personnel only: wear proper PPE while servicing.

All models have one (1) Unload Drive and one (1) Unload Breaker.
18' and 24' Cabinets have two (2) Fan Starters and two (2) Fan Breakers.
30' Cabinets (Model BCT 10000) have four (4) Fan Starters and four (4) Fan Breakers.



All auxiliary equipment (contactors, relays, motors, etc.) must be mounted in the Equipment Disconnect/ Power Cabinet. If any options (Block/Bleed, Aux Unload, Rear Wet Fill, etc.) are to be used, order the appropriate wiring/cable assembly from Brock.

 This Disconnect has a main circuit breaker/disconnect for <u>the Dryer</u> only. The Disconnect <u>Handle</u> is between the double doors of the Power Cabinet.

│ Figure 7. │ Red Control Cabinet and Dryer Disconnect/Power Cabinet

IMPORTANT!

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UNDER NO CIRCUMSTANCES should there be an AC Drive mounted INSIDE the red Control Cabinet. This will create an unsafe situation.

Volts	Phase	Hertz	Standard Starter	Optional Starters	
230	3	60	across line	Electronic Soft Start, part wind; AC Drive	
460	3	60	across line	Electronic Soft Start, wye-delta; AC Drive	
575	3	60	across line	Electronic Soft Start; AC Drive	
380	3	50	wye-delta	Electronic Soft Start	

Starter Voltage Table

Ensure that all wiring inside the AC Drive Cabinet is neatly tie-wrapped and is away from mechanical parts (*i.e.*, latches) which may eventually rub through the wiring. For wiring terminations in the Controller Cabinet, see **AC Drive Wiring Terminations in the Controller Cabinet** on page 32.



Ground the AC Drive Cabinet

A DANGER

An AC Drive must be GROUNDED and can be extremely dangerous if all safety precautions are not observed. It is very important with an AC Drive to WAIT for capacitors to discharge stored electrical energy BEFORE any service is begun on the Drive. If a capacitor explodes, there will be a shotgun-like blast. The danger of a capacitor explosion is similar to that of an arc flash. WAIT at least fifteen (15) minutes for the energy to dissipate from the capacitors. VERIFY THAT NO VOLTAGE IS PRESENT before proceeding. Failure to follow these instructions will create an imminently hazardous situation which, if not avoided, will result in serious injury that could lead to death.

	1 (13)		Do not use electrical cabi- nets for storage. Do not operate with doors open.
	12	Item	Description
460		1	Disconnect Lever ON/OFF
		2	Dryer Disconnect
		3	Control Transformer
		4	Control Panel Breaker
3		6	Unload O/L Relay
4		7	Fan #1 Fault Relay and Soft Start Relay
	117061	8	Fan #2 Fault Relay and Soft Start Relay
		9	Fan Soft Starts
	(14)	10	Unload Drive
		11	Unload Breaker
		12	Load Breaker
		13	Load Starter
	(10)	14	Fan Breakers
	9		Figure 9. 18' Electrical Power Cabinet,
Contraction of the local division of the loc		1.11	Doors OPEN
			Models 2500 through 4700

Do not use electrical cabinets for storage. Do not operate with doors open.



Item	Description
1	Disconnect Lever ON/OFF
2	Dryer Disconnect
3	Control Transformer
4	Control Panel Breaker
6	Unload O/L Relay
7	Fan #1 Fault Relay and Soft Start Relay
8	Fan #2 Fault Relay and Soft Start Relay
9	Fan #3 Fault Relay and Soft Start Relay
10	Fan #4 Fault Relay and Soft Start Relay
11	Fan Soft Starts
12	Unload Drive
13	Unload Breaker
14	Load Breaker
15	Load Starter
16	Fan Breakers



Figure 10. 30' Electrical Power/Equipment Disconnect Cabinet, Doors OPEN, Model BCT 10000

Allen-Bradley SMC-3 Drive Programming

The Allen-Bradley unit:

16

- ٠
- Provides regulated 24VDC to the Safety Board Regulates the AC feed down to +24VDC. This is fed to the 24V Control Board and from there is distributed to the other Boards (including the Safety Board) •
- Low-voltage DC is regulated on the CPU Board •



Figure 11A. SMC-3 Dipswitch Setup



Figure 11B. SMC-3 Dipswitch Setup

Allen-Bradley Power Flex 525 Setups

Display and Control Keys

	Menu	Parameter Group and Description
Allen-Bradley	Ь	Basic Display Commonly viewed drive operating conditions.
	p	Basic Program Commonly used programmable functions.
FAULTO	ł	Terminal Blocks Programmable terminal functions.
	[Communications Programmable communication functions.
	L	Logic (PowerFlex 525 only) Programmable logic functions.
	d	Advanced Display Advanced drive operating conditions.
	Я	Advanced Program Remaining programmable functions.
		Network Network functions that are shown only when a comm card is used.
Ener LINK EtherNet/P FAULTO	M	Modified Functions from the other groups with values changed from default.
	ł	Fault and Diagnostic Consists of list of codes for specific fault conditions.
	6	AppView and CustomView Functions from the other groups organized for specific applications.

Control and Navigation Keys

Display	Display State	Description	
	Off	Adapter is not connected to the network.	
ENET (PowerFlex 525 only)	Steady	Adapter is connected to the network and drive is controlled through Ethernet.	
	Flashing	Adapter is connected to the network but drive is not controlled through Ethernet.	
	Off	Adapter is not connected to the network.	
LINK (PowerFlex 525 only)	Steady	Adapter is connected to the network but not transmitting da	
	Flashing	Adapter is connected to the network and transmitting data.	
LED	LED State	Description	
FAULT	Flashing Red	Indicates drive is faulted.	
Кеу	Name	Description	
	Up Arrow Down Arrow	Scroll through user-selectable display parameters or groups. Increment values.	
Esc	Escape	Back one step in programming menu. Cancel a change to a parameter value and exit Program Mode.	
Sel	Select	Advance one step in programming menu. Select a digit when viewing parameter value.	
	Enter	Advance one step in programming menu. Save a change to a parameter value.	
	Reverse	Used to reverse direction of the drive. Default is active. Controlled by parameters P046, P048, and P050 [Start Source x] and A544 [Reverse Disable].	
	Start Used to start the drive. Default is active. Controlled by parameters P046, P048, and P050 [Start Sou		
	Stop	Used to stop the drive or clear a fault. This key is always active. Controlled by parameter P045 [Stop Mode].	
	Potentiometer	Used to control speed of drive. Default is active. Controlled by parameters P047, P049, and P051 [Speed Referencex].	

Viewing and Editing Parameters

The following is an example of basic integral keypad and display functions. This example provides basic navigation instructions and illustrates how to program a parameter.



Parameter Group	No.	Name	Default	BROCK Setting
	34	Motor NP FLA	18.6	18
	36	Motor NP RPM	1750	1800
	39	Torque Perf Mode	SVC	0
	41	Accel Time 1	10	30
	42	Decel Time 1	10	30
Р	44	Maximum Freq	60	120
	46	Start Source 1	Keypad	2
	47	Speed Reference1	Drive Pot	13
	48	Start Source 2	DigIn TrmBlk	1
	49	Speed Reference2	0-10V input	1
	51	Speed Reference3	EtherNet/IP	5
	62	DigIn TermBlk 02	2-Wire FWD	49
	63	DigIn TermBlk 03	2-Wire REV	0
	65	DigIn TermBlk 05	Preset Freq	13
T	66	DigIn TermBlk 06	Preset Freq	24
1	67	DigIn TermBlk 07	Spd + Strt 2	2
	68	DigIn TermBlk 08	Jog Forward	0
	81	Relay Out2 Sel	MotorRunning	24
	105	Safety Open En	FaultEnable	1
	128	EN Addr Sel	BOOTP	1
	129	EN IP Addr Cfg 1	0	192
	130	EN IP Addr Cfg 2	0	168
G	131	EN IP Addr Cfg 3	0	1
C	132	EN IP Addr Cfg 4	0	1
	133	EN Subnet Cfg 1	0	255
	134	EN Subnet Cfg 2	0	255
	135	EN Subnet Cfg 3	0	255
	180	Stp Logic 0	00F1	21
	181	Stp Logic 1	00F1	4021
	182	Stp Logic 2	241	4021
	183	Stp Logic 3	241	3811
L	190	Stp Logic Time 0	30	20
	191	Stp Logic Time 1	30	90
	192	Stp Logic Time 2	30	10
	193	Stp Logic Time 3	30	2
	410	Preset Freq 0	0	8
	411	Preset Freq 1	5	30
	412	Preset Freq 2	10	8
А	413	Preset Freq 3	20	0
	439	S Curve %	0	10
	531	Start Boost	2.5	8
	556	Text Scroll	Mid Speed	0

Setup for 7.5 HP 230V

Parameter Group	No.	Name	Default	BROCK Setting
	34	Motor NP FLA	10.1	9.5
	36	Motor NP RPM	1750	1800
	39	Torque Perf Mode	SVC	0
Р	41	Accel Time 1	10	30
	42	Decel Time 1	10	30
	44	Maximum Freq	60	120
	46	Start Source 1	Keypad	2
	47	Speed Reference1	Drive Pot	13
	48	Start Source 2	DigIn TrmBlk	1
	49	Speed Reference2	0-10V input	1
	51	Speed Reference3	EtherNet/IP	5
	62	DigIn TermBlk 02	2-Wire FWD	49
	63	DigIn TermBlk 03	2-Wire REV	0
	65	DigIn TermBlk 05	Preset Freq	13
т	66	DigIn TermBlk 06	Preset Freq	24
1	67	DigIn TermBlk 07	Spd + Strt 2	2
	68	DigIn TermBlk 08	Jog Forward	0
	81	Relay Out2 Sel	MotorRunning	24
	105	Safety Open En	FaultEnable	1
	128	EN Addr Sel	BOOTP	1
	129	EN IP Addr Cfg 1	0	192
	130	EN IP Addr Cfg 2	0	168
C	131	EN IP Addr Cfg 3	0	1
C	132	EN IP Addr Cfg 4	0	1
	133	EN Subnet Cfg 1	0	255
	134	EN Subnet Cfg 2	0	255
	135	EN Subnet Cfg 3	0	255
	180	Stp Logic 0	00F1	21
	181	Stp Logic 1	00F1	4021
	182	Stp Logic 2	241	4021
т	183	Stp Logic 3	241	3811
L	190	Stp Logic Time 0	30	20
	191	Stp Logic Time 1	30	90
	192	Stp Logic Time 2	30	10
	193	Stp Logic Time 3	30	2
	410	Preset Freq 0	0	8
	411	Preset Freq 1	5	30
	412	Preset Freq 2	10	8
	413	Preset Freq 3	20	0
	439	S Curve %	0	10
۸	496	IR Voltage Drop	4.3	8
A	497	Flux Current Ref	4.03	5.01
	498	Motor Rr	0	1.36
	499	Motor Lm	0	248.8
	500	Motor Lx	0	26
	531	Start Boost	2.5	8
	556	Text Scroll	Mid Speed	0

Setup for 7.5 HP 460V

Parameter	No.	Name	Default	BROCK
Group	24	Motor ND EL A	7 /	7 5
	34	Motor ND DDM	/.4	1800
	20	Torque Derf Mode	1730 SVC	1800
	39	A agal Time 1	10	20
	41	Accel Time 1	10	30
р	42	Maximum Erag	10	30 120
P	44	Start Source 1	00 V asura d	120
	40	Start Source 1	Neypad	<u> </u>
	47	Speed Reference 1	Drive Pol	15
	48	Start Source 2	Digin IrmBik	1
	49	Speed Reference2	0-10V input	1
	51	Speed Reference3	EtherNet/IP	5
	62	DigIn TermBlk 02	2-Wire FWD	49
	63	DigIn TermBlk 03	2-Wire REV	0
	65	DigIn TermBlk 05	Preset Freq	13
Т	66	DigIn TermBlk 06	Preset Freq	24
-	67	DigIn TermBlk 07	Spd + Strt 2	2
	68	DigIn TermBlk 08	Jog Forward	0
	81	Relay Out2 Sel	MotorRunning	24
	105	Safety Open En	FaultEnable	1
	128	EN Addr Sel	BOOTP	1
	129	EN IP Addr Cfg 1	0	192
	130	EN IP Addr Cfg 2	0	168
C	131	EN IP Addr Cfg 3	0	1
C	132	EN IP Addr Cfg 4	0	1
	133	EN Subnet Cfg 1	0	255
	134	EN Subnet Cfg 2	0	255
	135	EN Subnet Cfg 3	0	255
	180	Stp Logic 0	00F1	21
	181	Stp Logic 1	00F1	4021
	182	Stp Logic 2	241	4021
т	183	Stp Logic 3	241	3811
L	190	Stp Logic Time 0	30	20
	191	Stp Logic Time 1	30	90
	192	Stp Logic Time 2	30	10
	193	Stp Logic Time 3	30	2
	410	Preset Freq 0	0	8
	411	Preset Freq 1	5	30
	412	Preset Freq 2	10	8
А	413	Preset Freq 3	20	0
	439	S Curve %	0	10
	531	Start Boost	2.5	8
	556	Text Scroll	Mid Speed	0
1			r	

Setup for 7.5 HP 575V

Parameter Group	No.	Name	Default	BROCK Setting
	34	Motor NP FLA	18.5	19
	36	Motor NP RPM	1750	1800
	39	Torque Perf Mode	SVC	0
	41	Accel Time 1	10	30
	42	Decel Time 1	10	30
Р	44	Maximum Freq	60	120
	46	Start Source 1	Keypad	2
	47	Speed Reference1	Drive Pot	13
	48	Start Source 2	DigIn TrmBlk	1
	49	Speed Reference2	0-10V input	1
	51	Speed Reference3	EtherNet/IP	5
	62	DigIn TermBlk 02	2-Wire FWD	49
	63	DigIn TermBlk 03	2-Wire REV	0
	65	DigIn TermBlk 05	Preset Freq	13
т	66	DigIn TermBlk 06	Preset Freq	24
1	67	DigIn TermBlk 07	Spd + Strt 2	2
	68	DigIn TermBlk 08	Jog Forward	0
	81	Relay Out2 Sel	MotorRunning	24
	105	Safety Open En	FaultEnable	1
	128	EN Addr Sel	BOOTP	1
	129	EN IP Addr Cfg 1	0	192
	130	EN IP Addr Cfg 2	0	168
C	131	EN IP Addr Cfg 3	0	1
C	132	EN IP Addr Cfg 4	0	1
	133	EN Subnet Cfg 1	0	255
	134	EN Subnet Cfg 2	0	255
	135	EN Subnet Cfg 3	0	255
	180	Stp Logic 0	00F1	21
	181	Stp Logic 1	00F1	4021
	182	Stp Logic 2	241	4021
т	183	Stp Logic 3	241	3811
L	190	Stp Logic Time 0	30	20
	191	Stp Logic Time 1	30	90
	192	Stp Logic Time 2	30	10
	193	Stp Logic Time 3	30	2
	410	Preset Freq 0	0	8
	411	Preset Freq 1	5	30
	412	Preset Freq 2	10	8
А	413	Preset Freq 3	20	0
	439	S Curve %	0	10
	531	Start Boost	2.5	8
	556	Text Scroll	Mid Speed	0

Setup for 15 HP 460V

Parameter Group	No.	Name	Default	BROCK Setting
Group	34	Motor NP FLA	14.8	15
	36	Motor NP RPM	1750	1770
	39	Torque Perf Mode	SVC	0
	41	Accel Time 1	10	30
Р	42	Decel Time 1	10	30
	44	Maximum Freq	60	120
	46	Start Source 1	Kevpad	2
	47	Speed Reference1	Drive Pot	13
	48	Start Source 2	DigIn TrmBlk	1
	49	Speed Reference2	0-10V input	1
	51	Speed Reference3	EtherNet/IP	5
	62	DigIn TermBlk 02	2-Wire FWD	49
	63	DigIn TermBlk 03	2-Wire REV	0
	65	DigIn TermBlk 05	Preset Freq	13
_	66	DigIn TermBlk 06	Preset Freq	24
Т	67	DigIn TermBlk 07	Spd + Strt 2	2
	68	DigIn TermBlk 08	Jog Forward	0
	81	Relay Out2 Sel	MotorRunning	24
	105	Safety Open En	FaultEnable	1
	128	EN Addr Sel	BOOTP	1
	129	EN IP Addr Cfg 1	0	192
	130	EN IP Addr Cfg 2	0	168
G	131	EN IP Addr Cfg 3	0	1
C	132	EN IP Addr Cfg 4	0	1
	133	EN Subnet Cfg 1	0	255
	134	EN Subnet Cfg 2	0	255
	135	EN Subnet Cfg 3	0	255
	180	Stp Logic 0	00F1	21
	181	Stp Logic 1	00F1	4021
	182	Stp Logic 2	241	4021
т	183	Stp Logic 3	241	3811
L	190	Stp Logic Time 0	30	20
	191	Stp Logic Time 1	30	120
	192	Stp Logic Time 2	30	10
	193	Stp Logic Time 3	30	2
	410	Preset Freq 0	0	8
	411	Preset Freq 1	5	30
	412	Preset Freq 2	10	8
А	413	Preset Freq 3	20	0
	439	S Curve %	0	10
	531	Start Boost	2.5	8
	556	Text Scroll	Mid Speed	0

Setup for 15 HP 575V

Allen-Bradley Power Flex 525 Fault Code Descriptions

No.	Fault	Туре (1)	Description	Action			
F000	No Fault		No fault present.				
F002	Auxiliary Input	1	External trip (Auxiliary) input.	 Check remote wiring. Verify communications programming to intentional fault. 			
F003	Power Loss	2	Single-phase operation detected with excessive load.	 Monitor the incoming AC line for incoming voltage or line power interruption. Check input fuses. Reduce load. 			
F004	UnderVoltage	1	DC bus voltage fell below the minimum value.	Monitor the incoming AC line for low voltage or line power interruption.			
F005	OverVoltage	1	DC bus voltage exceeded maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.			
F006	Motor Stalled	1	Drive is unable to accelerate or decelerate motor.	 Increase F041, A442, A444, A440 [Accel Time x] or reduce load so drive output current does not exceed the current set by parameter A484, A485 [Current Limit x] for too long. Check for overhauling load. 			
F007	Motor Overload	1	Internal electronic overload trip.	 An excessive motor load exists. Reduce load so drive output current does not exceed the current set by parameter P033 [Motor OL Current]. Verify A530 [Boost Select] setting. 			
F008	Heatsink OverTmp	1	Heatsink/Power Module temperature exceeds a predefined value.	 Check for blocked or dirty heat sink fins. Verify that ambient temperature has not exceeded the rated ambient temperature. Check fan. 			
F009	CC OverTmp	1	Control Module temperature exceeds a predefined value.	 Check product ambient temperature. Check for airflow obstruction. Check for dirt or debris. Check fan. 			
F012	HW OverCurrent	2	The Drive output current has exceeded the hardware current limit.	Check programming. Check for excess load, improper A530 [Boost Select] setting, DC brake volts set too high or other causes of excess current.			
F013	Ground Fault	2	A current path to earth ground has been detected at one or more of the drive output terminals.	Check the motor and external wiring to the drive output terminals for a grounded condition.			
F015	Load Loss	2	The output torque current is below the value programmed in A490 [Load Loss Level] for a time period greater than the time programmed in A491 [Load Loss Time].	 Verify connections between motor and load. Verify level and time requirements. 			
F021	Output Ph Loss	2	Output Phase Loss (if enabled). Configure with A557 [Out Phas Loss En].	Verify motor wiring.Verify motor.			
F029	Analog In Loss	1	An analog input is configured to fault on signal loss. A signal loss has occurred. Configure with t094 [Anlg In V Loss] or t097 [Anlg In mA Loss].	 Check for broken/loose connections at inputs. Check parameters. 			

Fault Types, Descriptions and Actions

N T							
No.	Fault	Туре	Description	Action			
F033	Auto Rstrt Tries	2	Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of A541 [Auto Rstrt Tries].	Correct the cause of the fault and manually clear.			
F038	Phase U to Gnd		A phase to ground fault has	• Check the wiring between the drive			
F039	Phase V to Gnd	2	A phase to ground fault has been detected between the	and motor.			
F040	Phase W to Gnd		drive and motor in this phase.	Check motor for grounded phase.Replace drive if fault cannot be cleared.			
F041	Phase UV Short	_	Excessive current has been	• Check the motor and drive output			
F042	Phase UW Short	2	detected between these two	terminal wiring for a shorted condition.			
F043	Phase VW Short		output terminals.	• Replace drive if fault cannot be cleared.			
F048	Params Defaulted	1	The drive was commanded to write default values to EEPROM.	Clear the fault or cycle power to the drive.Program the drive parameters as needed.			
F059	Safety Open	1	Both of the safety inputs (Safety 1, Safety 2) are not enabled. Configure with t105 [Safety Open En].	Check safety input signals. If not using safety, verify and tighten jumper for I/O terminals S1, S2 and S+.			
F063	SW OverCUrrent	1	Programmed A486, A488 [Shear Pinx Level] has been exceeded for a time period greater than the time programmed in A487, A489 [Shear Pin x Time].	 Verify connections between motor and load. Verify level and time requirements. 			
F064	Drive Overload	2	Drive overload rating has been exceeded.	Reduce load or extend Accel Time.			
F070	Power Unit	2	Failure has been detected in the drive power section.	 Check maximum ambient temperature has not been exceeded. Cycle power. Replace drive if fault cannot be cleared. 			
F071	DSI Net Loss	2	Control over the Modbus or DSI communication link has been interrupted.	 Cycle power. Check communications cabling. Check Modbus or DSI setting. Check Modbus or DSI status. 			
F072	Opt Net Loss	2	Control over the network option card's remote network has been interrupted.	 Cycle power. Check communications cabling. Check network adapter setting. Check external network status. 			
F073	EN Net Loss	2	Control through the embedded EtherNet/IP adapter has been interrupted.	 Cycle power. Check communications cabling. Check EtherNet/IP setting. Check external network status. 			
F080	Autotune Failure	2	The autotune function was either canceled by the user or failed.	Restart procedure.			
F081	DSI Comm Loss	2	Communications between the drive and the Modbus or DSI master device have been interrupted.	 Cycle power. Check communications cabling. Check Modbus or DSI setting. Check Modbus or DSI status. Modify using C125 [Comm Loss Action]. Connecting I/O terminals C1 and C2 to ground may improve noise immunity. Replace wiring, Modbus master device, or control module. 			
F082	Opt Comm Loss	2	Communications between the drive and the network option card have been interrupted.	 Cycle power. Reinstall option card in drive. Modify using C125 [Comm Loss Action]. Replace wiring, port expander, option card, or control module. 			

Fault Types, Descriptions and Actions

No.	Fault	Type ⁽¹⁾	Description	Action
F083	EN Comm Loss	2	Internal communications between the drive and the embedded EtherNet/IP adapter have been interrupted.	 Cycle power. Check EtherNet/IP setting. Check drive's Ethernet settings and diagnostic parameters. Modify using C125 [Comm Loss Action]. Replace wiring, Ethernet switch, or control module.
F091	Encoder Loss	2	Requires differential encoder. One of the 2 encoder channel signals is missing.	 Check Wiring. If P047, P049, P051 [Speed References] = 16 "Positioning" and A535 [Motor Fdbk Type] = 5 "Quad Check", swap the Encoder channel inputs or swap any two motor leads. Replace encoder.
F094	Function Loss	2	"Freeze-Fire" (Function Loss) input is inactive, input to the programmed terminal is open.	Close input to the terminal and cycle power.
F100	Parameter Chksum	2	Drive parameter non-volatile storage is corrupted.	Set P053 [Reset To Defaults] to 2 "Factory Rset".
F101	External Storage	2	External non-volatile storage has failed.	Set P053 [Reset To Defaults] to 2 "Factory Rset".
F105	C Connect Err	2	Control module was disconnected while drive was powered.	Clear fault and verify all parameter settings. Do not remove or install the control module while power is applied.
F106	Incompat C-P	2	The control module could not recognize the power module.	Cycle power.Flash with newer firmware version.Replace drive if fault cannot be cleared.
F107	Replaced C-P	2	The control module was mounted to a power module with a different power rating.	Set P053 [Reset To Defaults] to any of the reset options.
F109	Mismatch C-P	2	The control module was mounted to a different drive type power module.	Set P053 [Reset To Defaults] to any of the reset options.
F110	Keypad Membrane	2	Keypad membrane failure / disconnected.	 Cycle power. Replace control module if fault cannot be cleared.
F111	Safety Hardware	2	Safety input enable hardware malfunction. One of the safety inputs is not enabled.	 Check safety input signals. If not using safety, verify and tighten jumper for I/O terminals S1, S2 and S+. Replace control module if fault cannot be cleared.
F114	uC Failure	2	Microprocessor failure.	Cycle power.Replace control module if fault cannot be cleared.
F122	I/O Board Fail	2	Failure has been detected in the drive control and I/O section.	 Cycle power. Replace drive or control module if fault cannot be cleared.
F125	Flash Update Req	2	The firmware in the drive is corrupt, mismatched, or incom- patible with the hardware.	Perform a firmware flash update operation to attempt to load a valid set of firmware.
F126	NonRecoverabErr	2	A non-recoverable firmware or hardware error was detected. The drive was automatically stopped and reset.	 Clear fault or cycle power to the drive. Replace drive or control module if fault cannot be cleared.
F127	DSIFlashUpdatReq	2	A critical problem with the firmware was detected and the drive is running using backup firmware that only supports DSI communications.	Perform a firmware flash update operation using DSI communications to attempt to load a valid set of firmware.
See ra	and types for more m	normatioi	1.	

Fault Types, Descriptions and Actions

Red Control Cabinet

Intui-DRY® Controller: The Brain of the System

Manual MFH2191 and **Schematic 3924-00028** (below) are necessary for installing the Intui-DRY® Controller components. Schematic 3924-00028 is included in both MFH2191 and THIS Manual.

Before Controller installation and activations on the circuit board are done, the Dryer must already be completely installed with auxiliary equipment ready to run.

Initial system checkout must be complete. This includes verifying proper motor rotation and checking for gas leaks in the supply plumbing train.



Figure 13. Intui-DRY® Manual MFH2191, English and Spanish (Hungarian also available)



Figure 14. BCT Electrical Schematic Intui-DRY® Control Wiring 3924-00065

Installations to the Internal Circuit Board

All Intui-DRY® connections here are made through plug-in type connectors. This reduces assembly errors and aids in troubleshooting the system.



Figure 13. Control and Power Panels Item Table on facing page.



With the exception of wiring terminations, DO NOT INSTALL any auxiliary components (physical hardware) in the Control Panel Cabinet. NO other changes or modifications other than the software changes described in the Intui-DRY® Manual are allowed on the Control Board Panels. Such modifications could result in equipment damage and/or void the Warranty.

All auxiliary equipment (contactors, relays, motors, etc.) must be mounted separately in the <u>Power</u> Cabinet. See pages 14-15.

Internal Control Panel, Circuit Board Identification

Item	Description	Function
		BRAIN of the system
	CDU Doord	Manages Dryer operation through the other Boards
1	(Control Processing	• Communicates with the Monitor and the outside world
1	Unit)	 Communicates with and manages moisture sensors
		• Regulates +24VDC down to +5VDC and +3.3VDC and provides those to the other Boards via the MCU BUS ribbon cable
		• Monitors all 24VDC, analog and input signals not safety-related
2	24V / Analog I/O	 Controls outputs to 24V loads not safety-related
2	Board	Monitors RTDs
		Controls analog output signals
		Controls outputs to 120VAC loads
3	120VAC Board	 Controls outputs to mixed 120VAC and 24VDC equipment
		 Controls miscellaneous 120VAC capable relays
		• Primary connection of all supplied power (120VAC + 24VDC)
	Safety Board	 Flame control, safety monitoring and shutdown of flame, of 120VAC and 24VDC power for safety-related items
4		• Monitors all safety-related signals; overrides CPU when a danger is sensed
		• Controls 120VAC and 24VDC outputs for safety-critical items
		• Provides all 120VAC and 24VDC to other Boards
		• Provides safety-related input to CPU Board for warnings, faults and alerts
	Allon Bradlov	• Regulates AC feed down to +24VDC to the CPU Board
5	Power Supply	• Directly supplies the CPU Board to provide constant 24V to other Boards,
-	1606-XLE	Including the Safety Board when a shutdown has occurred
	Dianum Air Draggura	• Low-voltage DC is regulated off the CFO Board
6	Gauge	Mounted in Inner Door
7	Honeywell® Burner Control	 All BCT models, some MEYER models; Safety Board wiring on other models and Low Profile models bypass this item
0	Intui-DRY®	Ethernet Port, Communication Cable input; see Intui-DRY® Manual MFH2191
0	Plug-In Area	USB Port, Intui-DRY® program installation; see Intui-DRY® Manual MFH2191
10	Power Panel	On BCT and Low Profile models, the Power Panel is mounted on its own separate backplate above the Internal Circuit Board.
11	Internal Circuit Board	 Combination of Items 1, 2, 3 and 4 Available as complete unit for replacement: 3923-00005, Low Profile and MEYER®, or 3923-00006 BCT. See Intui-DRY® Manual MFH2191.
12	Termination of Auxiliary area	This area at the top of the Safety Board (Item 4) includes (2) green Connectors J19 and J17 above Jumpers 11 and 12. Jumpers provide dry contact plug-ins to bypass Aux1 and/or Aux2 Safety Switches and hard-wire in Auxiliary equipment and/or overloads directly to the Control Panel Safety Chain. See "Plug-ins for Auxiliary Load and Unload," Intui-DRY® Manual MFH2191.

AC Drive Wiring Terminations in the Controller Cabinet





DO NOT RUN auxiliary wire for Load or Unload Motors directly over the Power Supply, printed circuit Boards or any other wiring in the red Control Panel enclosure. Follow the directions below to avoid an unsafe situation.

All wiring connections for devices terminating outside the Control Panel Cabinet are made through removable type screw terminal blocks with easy-to-read labeling. Initial hookup and subsequent troubleshooting can be done without consulting wiring diagrams.

If wiring is added in the field for connection of a Load or Unload Motor to a contactor inside the Control Cabinet, route the wiring over to the side of the box then down along the wall.

- Make sure these wires are **run directly** to the Motor with the **shortest length** of wire possible. The wiring must run **over to the side of the Panel**, up the side, and then over to its termination point. Terminations.
- There should be **no wires run alongside** Motor wires, specifically Comm Cable, Moisture Sensor Cable, or any other Control wiring.
- Physically separate Control wiring from output wires which go to the Motor. Try to keep Motor wires as far away from all other wiring as possible (minimum 1.5 [457] feet if in rigid conduit, 2.5 [762] feet if in Sealtight). Although rigid conduit provides the best shielding for wires, it is insufficient to eliminate radiated emissions. The greater the distance from these wires, the better the protection against radiated emissions.
- If other wires must cross the Motor wires, it is best that they **cross at a 90° angle** to minimize the induction of radiated emissions.
- Insure that all wiring inside the Control Cabinet is neatly tie-wrapped and away from mechanical parts (*i.e.*, latches) which may eventually rub through the wiring.

Plug-Ins for Termination of Auxiliary Load and Unload

Brock provides both normally-closed and normally-open contacts for Auxiliary Load and Auxiliary Unload. On pages 30-31, locate <u>Item 12</u> on the Safety Board. In this area the Installer may hard-wire in the User's Auxiliary equipment and overloads *via* dry contact plug-ins. **This step must be done at installation**. Two Jumpers, part of the Safety chain—are where Auxiliary overloads may be plugged in—in the event of system failure-shutdown. If there are no overloads to plug in, there are small plastic jumpers that plug over the pins here. See **Figure 14** below.

- To put Aux safety switch(es) in the safety circuit/chain, wire them to J17 (AUX1) and J19 (AUX2).
- JMP11 and JMP12 <u>bypass</u> the safety circuit, so that the lack of one or more Aux safety switches is not considered a FAULT that shuts the system down.
- JMP11 bypasses AUX2 above it.
- JMP12 bypasses both AUX1 and AUX2.
- If there are <u>no</u> Aux safety switch(es), install jumper JMP12.

Item	Description
1	Connector J19 (AUX2)
2	Connector J17 (AUX1)
3	Jumper JMP11
4	Jumper JMP12



Figure 14. Auxiliary Bypass Area, Top of Safety Board

GROUND the Control Cabinet to Earth



Once the Dryer has been properly wired, GROUND the Control Cabinet with a Ground Rod, located and connected as close to the Dryer frame as possible.

A solid copper ground wire is shipped coiled from the bottom of the Control Panel enclosure. A copper Equipment Ground Rod 5/8" dia. x 10' [3 048] is shipped loose.

Secure the copper grounding wire by installing a rubber fitting* in the rear floor of the red Control Panel. Install rubber retainer loops every 8" [20.3 cm] across and down the Control Cabinet Mounting Brackets. Run the copper wire through the loops and across the pad close to the Leg Base, securing the wire to the pad, and clamp.

About 6" [15.2. cm] from the edge of the concrete pad in front of the red Control Panel, **pound the Grounding Rod into the ground** with a rotary sledge hammer until 1 1/2" [3.8 cm] of the rod is visible above ground level.



The BROCK® Ground Rod is for the computerized circuitry and should not be expected to provide grounding for the remaining equipment connected to the public utility located on the farm or elevator premises.





Item	Description
1	Red Control Cabinet
2	Copper Grounding Wire
4	Control Panel Mounting Brackets
5	Rubber Retainer Loops
8	Concrete Pad
9	BCT Dryer Leg



Figure 15. Routing the Copper Grounding Wire

See Figure 16



1(

8

Detail A: TOP VIEW

Route the copper wire to the edge of the pad and down the side. Protect the wire at this turn with a rigid conduit pull elbow. See the Detail A below.

Figure 16, left. Conduit and Clamp Detail at the Pad, BCT Dryer

2

Item	Description
2	Copper Grounding Wire
3	Grounding Rod, buried
4	Control Panel Mounting Brackets
6	Conduit and Clamp
7	Acorn Nut
8	Concrete Pad
9	BCT Dryer Leg
10	Rigid Conduit Pull Elbow

About 1/2" [5.7 mm] below the top of the buried grounding rod, clamp the copper wire to the rod with an Acorn Nut (Item 7).

With a hammer, pound the wire as flat to the ground as possible, so the wire will not be a tripping hazard.

Cover the clamped connection with dirt. See **Detail B**.

DETAIL AT PAD

FRONT VIEW



Figure 17. Connect the Copper Grounding Wire to the Buried Grounding Rod



Detail B: Grounding Rod, Buried



Appendix A: Electrical Specifications

			Moto	r/Gearbox		Unload Ring					Intui-DRY® setup			
	MODEL	HP	rpm	size HP	ratio xx:1	rpm	DR sprkt	DN sprkt	rpm	fpm @CL	bph	Column bu.	Minutes to unload	
	2500	7.5	3,520	943H/W	59.3	59	17	384	2.63	93	3,817	2,354	37.0	
	3000	7.5	3,520	943H/W	59.3	59	19	384	2.94	104	4,266	2,880	40.5	
18'	3500	7.5	3,520	943H/W	59.3	59	21	384	3.25	115	4,715	3,205	40.8	
	4000	7.5	3,520	943H/W	59.3	59	23	384	3.56	125	5,164	3,704	43.0	
	4700	7.5	3,520	943H/W	59.3	59	26	384	4.02	142	5,838	4,230	43.5	
	5000	7.5 (x2)	3,520	943H/W	59.3	59	20	608	1.95	106	6,719	5,306	47.9	
24'	6000	7.5 (x2)	3,520	943H/W	59.3	59	24	608	2.34	128	8,063	5,745	43.3	
	7000	7.5 (x2)	3,520	943H/W	59.3	59	27	608	2.64	144	9,070	6,220	41.6	
30'	10000	7.5 (x2)	3,520	943H/W	59.3	59	30	864	2.06	162	13,501	8,426	37.4	

Unload Drives

Electrical Loads and Specifications

Model	BCT	BCT	BCT	BCT	BCT	BCT	BCT	BCT	BCT
Wiouci	2500	3000	3500	4000	4700	5000	6000	7000	10000
			4	460v 3ph					
Fan Motor HP	50	60	75	100	125	100	125	150	100
Fan Motor fla	58	69	87	113	141	113	141	168	112
Fan Motor qty	2	2	2	2	2	2	2	2	4
Unload Motor HP	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Unload Motor fla	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Unload Motor Qty.	1	1	1	1	1	2	2	2	2
Aux Motor HP	10	10	10	10	10	10	10	10	10
Aux Motor amps	12	12	12	12	12	12	12	12	12
Total fla amps	137	159	195	247	303	257	313	367	479
Total KW at 460V	98	114	140	177	217	184	224	263	343
Total KVA	109	127	156	197	242	205	249	292	381
Main CB size (amps)	200	300	300	400	450	400	450	600	1000
			5	575v 3ph				l	
Fan Motor HP	50	60	75	100	125	100	125	150	100
Fan Motor fla	46	54.4	68.7	89.6	115	89.6	115	135	89.6
Fan Motor qty	2	2	2	2	2	2	2	2	4
Unload Motor HP	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Unload Motor fla	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Unload Motor Qty.	1	1	1	1	1	2	2	2	2
Load Motor HP	10	10	10	10	10	10	10	10	10
Load Motor amps	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Total fla amps	109	126	155	196	247	204	255	295	383
Total KW at 575V	78	90	111	141	177	146	182	211	274
Total KVA	87	100	123	156	197	163	203	235	305
Main CB size (amps)	175	200	225	300	400	400	400	500	600

BROCK® BCT Electrical Installations and Wiring Schematics

Blower Drives

Model	BCT 2500	BCT 3000	BCT 3500	BCT 4000	BCT 4700	BCT 5000	BCT 6000	BCT 7000	BCT 10000
Motor									
Cat. No.	EM4115T	M4314T	M4115T	M4400T	M4410T-4	M4400T	M4410T-4	M4406T-4	M4400T
Frame	326T	364T	365T	405T	444T	405T	444T	445T	405T
HP	50	60	75	100	125	100	125	150	100
PN	2475-05021	2475-06021	2475-07521	2475-10021	2475-12541	2475-10021	2475-12541	2475-15021	2475-10021
Delta Fla	58.0	69.0	87	113	141	113	141	168	112
RPM	1,775	1,770	1,775	1,780	1,780	1,780	1,780	1,780	1,775
Sheave	5V8.0x3 SF	5V8.5x3 SF	5V9.25x3 SF	5V10.3x4 E	5V14.0x4 E	5V9.25x4 E	5V11.3x4 E	5V10.9x5 E	5V9.25x5 E
PD	8.00	8.50	9.25	10.30	14.00	9.25	11.30	10.90	9.25
PN	2477-00803	2477-00853	2477-00923	2477-01034	2477-01404	2477-00934	2477-01134	2477-01095	2477-09255
Bushing	sf-2 1/8	SF-2.375	SF-2.375	E-2 7/8	E-3 3/8	E-2 7/8	E-3 3/8	E-3 3/8	E-2 7/8
PN	2486-00001	2486-00006	2486-00006	2477-00007	2477-00003	2477-00007	2477-00003	2477-00003	2477-00007
Blower									
Target RPMs	755	814	880	975	1053	592	641	687	695
Size	490bae	490bae	490bae	490bae	490bae	660bae	660bae	660bae	600bae
PN	2483-00490	2483-00490	2483-00490	2483-00490	2483-00490	2483-00660	2483-00660	2483-00660	2483-00600
RPM	759	805	878	980	1,056	588	639	693	696
Sheave	5V18.7x3 E	5V18.7x3 E	5V18.7x3 E	5V18.7x4 E	5V23.6x4 F	5V28.0x4 F	5V31.5x4 F	5V28.0x5 F	5V23.6x5 F
PD	18.70	18.70	18.70	18.70	23.60	28.00	31.50	28.00	23.6
PN	2477-01873	2477-01873	2477-01873	2477-01874	2477-02364	2477-02804	2477-02804	2477-02805	2477-02365
Bushing	E 3 7/16	E 3 7/16	E 3 7/16	E 3 7/16	F 3 7/16	F 3 15/16	F 3 15/16	F 3 15/16	F 3 7/16
PN	2477-00231	2477-00231	2477-00231	2477-00231	2477-00241	2477-00261	2477-00261	2477-00261	2477-00241
Belt									
Size	5VX2000	5VX2000	5VX2000	5VX2000	5V2120	5V2650	5V2650	5V2650	5V2240
Qty	3	3	3	4	4	4	4	5	5
PN	2494-02005	2494-02005	2494-02005	2494-02005	2494-02125	2478-02655	2478-02655	2478-02655	2478-02245
Engineering I	nformation								
SF	1.70	1.53	1.35	1.53	1.42	1.18	1.2	1.2	1.44
Target CD	77.5	78.4	78.4	77.5	76.2	102.5	99.4	101.6	85.3
CD in	78.85	78.5	77.9	77.1	76.3	102.8	98.4	101.6	85.9
Hub load lb	1163-1745	1181-1771	1201-1801	1624-2436	1386-2079	1415-2122	1468-2202	1822-2733	1718-2577
Defl. Inch	1.23	1.22	1.22	1.20	1.19	1.60	1.53	1.58	1.34
Load Lb	13.83-20.75	14.08-21.11	14.38-21.57	14.71-22.07	13.51-20.26	12.93-19.04	13.65-20.48	13.51-20.26	12.61-18.92

Specifications and Capacities

Model	BCT2500	BCT3000	BCT3500	BCT4000	BCT4700	BCT5000	BCT6000	BCT7000	BCT10000
Height	69' - 2''	80' - 9''	88' - 7''	100' - 3''	111' - 10''	105' - 10''	113' - 7''	121' - 4''	131' - 1"
Diameter	18'	18'	18'	18'	18'	24'	24'	24'	30'
Grain Column Width	123/4, 103/4"	12¾, 10¾"	12¾, 10¾"	123/4, 103/4"	12¾, 10¾"	12¾, 10¾"	12¾, 10¾"	12¾, 10¾"	123/4, 103/4"
Internal Platform (std.)	1	1	1	1	1	1	1	1	2
External Platforms	2	2	2	3	4	3	4	4	3
Blower HP	(2) 50	(2) 60	(2) 75	(2) 100	(2) 125	(2) 100	(2) 125	(2) 150	(4) 100
DWDI Blower	(2) 490	(2) 490	(2) 490	(2) 490	(2) 490	(2) 660	(2) 660	(2) 660	(4) 600
Cool Ratio	27%	27%	24%	26%	27%	24%	22%	25%	23%
Average CFM/BU	90.9	81.3	79.2	79.9	77.0	73.1	74.2	78.9	75.0
Drying airflow (CFM)	122,740	152,576	174,274	201,772	221,504	269,750	306,482	344,376	457,952
Max. Burner Capacity (1,000 BTU/HR)	27,002	32,956	37,643	43,583	47,845	58,266	66,200	74,385	100,749
Gallons/hour	194	230	264	310	336	387	460	519	
Typical. Burner Capacity (1,000 BTU/HR)	13,320	17,700	20,900	24,000	26,000	30,300	36,300	40,100	57,427
Gallons/hour	145	179	208	241	263	303	359	404	
Unload Motor HP	7.5	7.5	7.5	7.5	7.5	10	10	10	(2) 7.5
Max. Unload Rate BPH	3,533	4,266	4,715	5,164	5,838	7,640	7,969	8,965	13,034
Nominal / Drying Capacity - wet B	PH								•
Corn 20-15%	2,500	3,000	3,500	4,000	4,700	5,000	6,000	7,000	10,000
Corn 25-15%	1,500	1,800	2,100	2,400	2,800	3,000	3,600	4,200	6,000
BUSHEL CAPACITIES									
Garner	660	660	660	660	660	1,422	1,422	1,422	2,300
Heat Columns	1,350	1,876	2,200	2,525	2,875	3,690	4,129	4,367	6,061
Steep Columns	175	175	175	175	175	237	237	237	299
Cool Columns	701	701	701	876	1,052	1,187	1,187	1,424	1,797
Unload	128	128	128	128	128	192	192	192	269
Total Bushel Capacity	3,014	3,540	3,864	4,364	4,890	6,728	7,167	7,642	10,726

Appendix B: Pre-Startup Electrical Testing and Inspection



Pre-Startup Electrical Testing Is Required!

Electricity can kill! Startup inspections MUST be done with the MAIN POWER LOCKED OUT and TAGGED OUT. Failure to follow these instructions will create an imminently hazardous situation which, if not avoided, will result in serious injury that could lead to death.

With MAIN POWER LOCKED OUT and TAGGED OUT, and with NO VOLTAGE detected, inspect electrical controls and wire connections for tightness. See the note below left about qualified personnel to make this inspections.

Review and follow the "Electrical Connection/Disconnection Procedures for Dryer Testing" below, OSHA Lockout/Tagout regulation 1910.33(b)(2) through 1910.333(c)(2), and the "Manufacturer's Recommended Minimum Lockout/ Tagout Energy Control Procedures" in this Manual.

Electrical Connection/Disconnection Procedures for Equipment Testing

These procedures MUST be followed by Installers of BROCK® equipment. Failure to follow these procedures could create a potentially hazardous situation which, if not avoided, could cause serious injury that could lead to death. See the note at left about qualified Installers.

Connecting Procedures:

- 1. BEFORE ANY TESTING, make certain all Service Disconnects are in the OFF position and LOCKOUTS/TAGOUTS are in place!
- 2. Verify that the Disconnect to the equipment being tested is in the OFF position.
- 3. Verify proper voltage to be used; see the Electrical Loads Chart for this equipment.
- 4. Verify that your voltage tester is operating properly: Test it on a **known live** voltage source to verify that the tester is working properly **before** testing the power source to the equipment.
- 5. Check for voltage at the equipment Disconnect. NO VOLTAGE should be present!
- 6. Before powering up, a 10' [3.048 m] area around the open panel to be "energized" will need to be blocked off with a non-conductive perimeter guard. Only properly protected and trained personnel can enter this area when the open panel is energized.
- 7. You may now TURN ON the **Service** Disconnect (wherever it is located for your facility, usually in a building away from the Dryer), and then turn on the equipment Disconnect to perform all required tests.

Disconnecting Procedures:

1. Turn OFF the Motor or Motors, and then turn off the equipment Disconnect.

- 2. Turn OFF, LOCKOUT and TAGOUT the Service Disconnect (wherever it is located at your facility).
- 3. a. If the purpose of the disconnection is to POWER DOWN while not in use: After the power is locked/tagged OUT, check that all is clear. Then push the START switch to confirm that the unit will not start, as instructed in the Manufacturer's LOCKOUT/TAGOUT Procedures.

b. If the purpose of the disconnection is to WORK on the electrical controls, a qualified electrician with proper PPE should perform these tests, after following LOCKOUT/TAGOUT (LOTO) Procedures. The qualified electrician must: verify that the voltage meter being used is working properly (*i.e.*, with a fully charged battery source that will give an accurate reading). Test the voltage meter on a **known** voltage source, and then confirm **after** Locking/Tagging out the power source, so there is no voltage present.

4. All Disconnects MUST ALWAYS REMAIN IN THE "OFF" POSI-TION, LOCKED OUT and TAGGED OUT when not in use!



IMPORTANT!

Pre-Startup electrical testing is REQUIRED. Procedures outlined on this page provide MINIMUM instructions to be followed by the QUALIFIED ELECTRICAL PERSONNEL performing Startup on this Dryer. Any additional applicable laws, regulations, and codes that may apply to such procedures MUST be followed. Inclusion of these procedures in this Manual does NOT in any way imply that these procedures can be used by unqualified personnel or in substitution for Qualified Electrical Personnel.

Appendix C: Lockout/Tagout

The following procedures amount to minimum instructions for Lockout/Tagout. Any more stringent, current, or up-todate requirements pursuant to OSHA or other regulations must be followed to the extent applicable.

Manufacturer's Recommended Minimum Lockout/Tagout Energy Control Procedures Purpose

The procedures listed herein are intended to provide minimum instructions to operators and/or end users of products supplied by the Manufacturer. To the extent that applicable laws, regulations, and/or codes, (such as, without limitation, OSHA regulations and requirements), provide more stringent requirements, all erectors, installers, operators and/or end users of the products referenced in this manufacturer's product manual, such applicable laws, regulations and/or codes MUST be followed. Whenever maintenance or servicing is completed to machines or equipment, all such maintenance and servicing shall be completed in accordance with the requirements of OSHA's 1910.147, et seq., including any amendments thereto. Such requirements are designed to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees or operators perform any maintenance or servicing where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

Authorized and Affected Individuals

Authorized operators and individuals who must be trained on these procedures include, without limitation, individuals who must lock out or tag out machines or equipment in order to perform servicing or maintenance on that machine or equipment. Affected individuals who must follow these procedures and be trained on the minimum requirements stated herein include individuals whose job responsibilities or operational responsibilities require him/her to operate or use a machine or equipment on which servicing or maintenance may be performed, or whose job responsibilities or operational responsibilities require him/her to operation and responsibilities or operational responsibilities require him/her to work in an area in which such servicing or maintenance is being performed. An individual should not be authorized to perform such job responsibilities and/or operational responsibilities until he/she is properly trained on these procedures and is properly trained to complete such servicing or maintenance tasks.

Service and/or Maintenance

Work place activities such as construction, installing, setting up, adjusting, inspecting, modifying and maintaining and/or servicing machines or equipment must be subject to the minimum procedures stated herein and any additional procedures required by applicable law, regulation or code. Additional activities, such as lubrication, cleaning or unjamming of machines or equipment, and making adjustments or tool changes, where the individual performing the activity may be exposed to the unexpected energization or start up of the equipment or release of hazardous energy must also be subject to the minimum procedures stated herein and any additional procedures required by applicable law, regulation or code.

These minimum procedures must be followed by maintenance and setup personnel. Maintenance personnel must follow such minimum procedures in the event that any type of required repair, cleaning, maintenance, inspections, adjusting, or servicing (e.g., electrical, mechanical, or other such servicing that requires entrance into or close contact with the machinery).

Setup personnel must follow these minimum procedures in the event that any type of setup is required (e.g., replacing dies, adjusting guards, adjusting die components / tooling, removal of jammed parts, or other such activities that require entrance into or close contact with the machinery).

Machinery and Equipment

Unlike small appliances or hand tools, industrial machinery requires more than turning off a switch and unplugging. The power for such equipment comes from multiple, interactive energy sources. If all energy sources are not isolated before service (setup and/or maintenance) is performed, an accidental release of energy could occur which could result in serious injury or even death. These forms of energy include: electrical, pneumatic, chemical, thermal, hydraulic, mechanical, or gravity. When machines or equipment need to be serviced, this energy must be isolated so authorized personnel can safely perform the work.

Each individual fitting the above descriptions must be issued locks, with identifying tags, which must be used only by that person. Locks must not be transferable from person to person, and each individual must be held responsible for his/her own locks and keys. Each lock must be numbered and a master list showing the number, and the individual using it, must be under the supervision of the facilities or project site manager.

Lockout/Tagout Procedures

Lockout/Tagout is the preferred method of isolating machines, or equipment, from energy sources. Tagout is to be performed, instead of lockout, only when there is no way to lockout a machine. The authorized maintenance supervisor must be notified if there is no way to lockout a machine. The authorized maintenance supervisor must be notified if there is no way to lockout a machine. The authorized maintenance supervisor must be notified if there is no way to lockout a machine. The authorized maintenance supervisor must be notified if there is no way to lockout a machine. The authorized maintenance supervisor must be notified if there is no way to lockout a machine.

Affected individuals must be notified when their machine is to be locked out according to the following method. All types of machinery and equipment mentioned above must be subject to these minimum shutdown, isolation, blocking and securing procedures for Lockout/Tagout.

Step One: Preparation for shutdown

Before an authorized or affected individual turns off a machine or equipment, the authorized individual shall have a working knowledge of the specific equipment, the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

Step Two: Machine or equipment shutdown

The machine or equipment shall be turned off or shut down using the procedures established for that specific machine or piece of equipment. An orderly shutdown must be utilized to avoid any additional, or increased, hazard(s) to individuals as a result of equipment stoppage.

Step Three: Machine or equipment isolation

All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated, in such a manner, as to isolate the machine or equipment from the energy source(s).

Step Four: Lockout/Tagout device application

All types of machinery and equipment listed above fall under these lockout placement, removal, transfer, and responsibility minimum procedures. Lockout/Tagout devices shall be affixed to each energy isolating device by authorized individuals. Lockout devices, where used, shall be affixed in a manner that will hold the energy isolating devices in a "safe" or "off" position. Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited. Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

Step Five: Stored energy

Following the application of Lockout/Tagout devices to energy isolating devices, all potentially hazardous stored or residual energy must be relieved, disconnected, restrained, and otherwise rendered safe. If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

Step Six: Verification of isolation

Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized individual shall verify that isolation and deenergization of the machine or equipment have been accomplished, even though isolation is performed prior to shutdown and is checked at that point. Verify the isolation of the equipment by operating the push button or other normal operating or startup control(s) to make certain the equipment will not operate. Return the operating control(s) to neutral or ioffi position after verifying that the equipment is isolated. The machine or equipment is now locked out and servicing or maintenance may safely begin.

Step Seven: Release from Lockout/Tagout.

Before Lockout/Tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized individual(s) to ensure the following:

The machine or equipment: The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

Individuals Present: The work area shall be checked to ensure that all individuals have been safely positioned or removed. After Lockout/Tagout devices have been removed and before a machine or equipment is started, affected individuals shall be notified that the Lockout/Tagout device(s) have been removed.

Step Eight: Lockout/tagout devices removal

Each Lockout/Tagout device shall be removed from each energy isolating device by the individual who applied the device. Exception: When the authorized individual who applied the Lockout/Tagout device is not available to remove it, that device may be removed under the direction of the authorized supervisor, provided that specific procedures and training for such removal have been developed, documented and incorporated into the owner's control program. The owner shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized individual who applied it. The specific procedure shall include at least the following elements: a. Verification by the owner (supervisor / manager) that the authorized individual who applied the device is not at the facility / project site.

b. Making all the reasonable efforts to contact the authorized individual to inform him/her that his/her Lockout/Tagout device has been removed.

c. Ensuring that the authorized individual has the knowledge before he/she resumes work at that facility / project site.

Shift or Personnel Changes

When a shift or personnel change occurs, a designated individual shall ensure the continuity of Lockout/Tagout protection.

The designated individual shall provide for the orderly transfer of Lockout/Tagout devices between off-going and on-coming individuals to minimize risk from stored energy

In general, if a piece of equipment is locked out at shift change, the person on the next shift must apply their lock before the individual who is leaving can remove their lock. In the event that no authorized individual or supervisor is available to transfer the Lockout/Tagout device, a designated department lock can be used to lockout the equipment during this time frame. As soon as the next shift authorized individual is available, he/she must ensure the equipment is properly de-energized and then place their own Lockout/Tagout device on the equipment.

At this point in time the department lock should be removed and returned to its designated storage location. The department lock is never to be used as an individual lockout protection device while servicing or repairing equipment.

Group Lockout/Tagout

If more than one individual is servicing or setting up the machinery, each individual will use their own lock on the lockout. This prevents undue exposure to a potential hazard. The last individual working on the machinery will remove his/her lock and the tag indicating the work has been completed. The locks should remain on the switch until all work has been completed unless it is necessary for the machinery to be operable between servicing and/or maintenance and does not expose the worker or operator to any unnecessary danger.

Operator Training

The owner must provide effective initial training and retraining as necessary and must certify that such training has been given to all workers and operators covered by these minimum procedures. The certification must contain each worker and/or operator's name and dates of training.

For the purposes of these minimum procedures, there are three types of individuals — authorized, affected, and other. The amount and kind of training that each individual should receive is based upon (1) the relationship of that individual's responsibilities in relation to the machine or equipment being locked and

tagged out, and (2) the degree of knowledge relevant to hazardous energy that he or she must possess. For example, the owner's training program for authorized individuals (those who are charged with the responsibility for implementing the energy control procedures and performing the service and maintenance) must cover, at minimum, the following areas: (1) details about the type and magnitude of the hazardous energy sources present in the workplace; and (2) the methods and means necessary to isolate and control those energy sources (i.e., the elements of the energy control procedures). By contrast, affected individuals (usually the machine operators or users) and all other individuals who have access to such machines and/or equipment must be able to: (1) recognize when the control procedure is being implemented; and (2) understand the purpose of the procedure and the importance of not attempting to start up or use the machinery and/or equipment that has been locked or tagged out.

Because an laffectedi individual is not one who is performing the service or maintenance, that individual's responsibilities under these minimum procedures are more simple (i.e., whenever there is a Lockout/Tagout device in place on an energy isolating device, the affected individual must leave it alone and never attempt to operate the machinery and/or equipment).

Every training program must ensure that all authorized and affected individuals understand the purpose, function and restrictions of these minimum energy control procedures and that authorized individuals possess the knowledge and skills necessary for the safe application, use, and removal of energy controls. Training programs used for compliance with these minimum procedures and/or other more stringent applicable procedures, which are performance-ori-

ented, should deal with the equipment, type(s) of energy, and hazard(s) specific to the environment being covered.

Retraining must be provided, as required, whenever there is a change in work and/or operational assignments, a change in machines, equipment or processes that present a new hazard, or a change in minimum energy control procedures. Additional retraining must be conducted whenever a periodic inspection reveals, or whenever the relevant authorized supervisor has reason to believe, that there are deviations from or inadequacies in the authorized individual's knowledge or use of the minimum required energy control procedure.

Periodic Inspection

A periodic inspection is done, looking at the minimum energy control procedures performed to ensure that such minimum procedures and requirements are being followed. The inspection should be performed monthly by the authorized supervisor with the intent of evaluating the authorized individuals at least once per year. This information should be recorded on a Lockout/Tagout Inspection Sheet / Log. All original copies should be maintained by the owner of the equipment and/or machinery.

Outside personnel (contractors, etc.)

The owner and any third party contractor engaged to perform installation, maintenance or operation of the equipment and/or machinery must advise each other of their respective minimum Lockout/Tagout procedures. Each party must ensure that his or her personnel must understand and comply with all restrictions and / or prohibitions of the other party's minimum energy control procedures.

Administrative Duties

The authorized supervisors are responsible for the daily follow-through of the required minimum procedures for each applicable piece of equipment and/ or machinery. Violation of the required minimum procedures set by the owner must be addressed appropriately by the owner and/or authorized supervisor. The owner of the applicable equipment and/or machinery must review and update the required minimum procedures as necessary. Rev. 09/18/07

Appendix D: Electrical Symbols

1	NUMBERED WIRING TERMINAL -		
~~	LOCATED ON TERMINAL STRIP		VARIABLE RESISTOR
	WIRE TERMINAL - NOT LOCATED ON TERMINAL STRIP		
h	GREUND	7 PD 2 NO 3,5 ON DELAY NC 4,6	TIMER, ON DELAY
FU4	FUSE	FT	TIMER, N.D.T.C AFTER TIMER CDIL IS ENERGIZED
7 MR 2N08 2 N08 NC9	CDIL, RELAY DR MAGNETIC MOTOR STARTER		TIMER, N.C.T.C AFTER TIMER CDIL IS ENERGIZED
SOL1	SERIES COIL - SOLENDID		TIMER, N.D. INSTANT CONTACTS AFTER TIMER COIL IS ENERGIZED
			TIMER, N.C. INSTANT CONTACTS AFTER TIMER COIL IS ENERGIZED
-®-	PILOT LIGHT - RED LENS	TAS1	THERMOSTAT - N.O. MAKE ON TEMPERATURE RISE
	N.D. CONTACTS, RELAY DR MOTOR STARTER	TAS2	THERMOSTAT - N.C. BREAK ON TEMPERATURE RISE
	N.C. CONTACTS, RELAY DR MOTOR STARTER	PS1	PRESSURE SWITCH - N.D. MAKE DN PRESSURE RISE
LS1	LIMIT SWITCH, N.C.	PS2	PRESSURE SWITCH - N.C. BREAK ON PRESSURE RISE
-LS2	LIMIT SWITCH, N.D.	FS1	FLOW SWITCH - N.D. AIR DR GRAIN
TG1 SS1	TOGGLE SWITCH, N.D.	FS2	FLOW SWITCH - N.C. AIR OR GRAIN
_ OX_ SS2	SELECTOR SWITCH, N.D.	A1 A2 NO NC 15	COIL, MAGNETIC MOTOR STARTER
<u> </u>	SELECTOR SWITCH, N.C.	0L1 	DVERLOAD RELAY CONTACT ON A
<u>00X</u>	SELECTOR SWITCH, N.D. 3 POSITION MOMENTARY	M1	
0x0	2ND CONTACTS SELECTOR SWITCH, N.C. 3 POSITION MOMENTARY	13 CB1	
	PUSH BUTTON - N.D. MOMENTARY CONTACT	^{7A} [°] ^{H1} 0 H3 00 H2 00 H4	CONTROL TRANSFORMER - DUAL
PB5	PUSH BUTTON - N.C. MOMENTARY CONTACT	ТСТ КУА Х1 Х2	VULINGE-IKUN CUKE
	RESISTOR, XX OHMS		THERMOCOUPLE, TYPE J
VM1	VOLT METER	I/0 PCB PJ1	PLUG - JACK ON I/D BOARD
D06-K1		1~1	APPENDIX K

Appendix E: Honeywell Fault Codes

Honeywell Burner Control Faults (Blink Codes)

Blink Code*	Fault Description	Blink Code*	Fault Description
1-1	Low AC Line Voltage	4-3	Flame Amplifier Problem
1-2	AC Quality Problem	4-4	Configuration Jumper Problem
2-1	Unexpected Flame Signal	5-1	PII Fault
2-2	Flame Signal Absent	5-2	HFS/LFS Fault
2-3	Flame Signal Overrange	5-3	MOS/Start Switch
3-1	Running ILK Switch Problem	6-1	Output Drive Failure
3-2	Running ILK Switch in Standby	6-2	Internal Fault
3-3	Valve Proving Fault	6-3	Device Specific Fault
4-1	Purge Card Problem	6-4	Accessory Fault
4-2	Wiring Problem/Internal Fault	7-7	Unrecognized Fault

* Blink Codes are read from the green power LED when the relay module is locked out (alarm LED is on). A blink code consists of 1 or more fast blinks followed by one (1) or more slow blinks.

HONEYWELL Keyboard Display Module Sequence and Status Hold Messages

Sequence	Status
INITIATE mm:ss	The Keyboard Display Module (KDM) indicates the burner status, INITIATE, a stabilization period for the relay module to check for any fluctuations in ac line voltage inputs or control inputs on powerup or during normal operation. The timing of the INITIATE period is either two seconds or ten seconds, depending on the model, before entering STANDBY.
If the relay module is in a	n INITIATE HOLD status, the following conditions could exist:
INITIATE HOLD: (AC Frequency/Noise)	The KDM indicates the burner status and that it is waiting for excess line noise to clear up, which prevents sufficient reading of the line voltage inputs. The burner sequence does not advance into STANDBY until the excess line noise ceases or a line frequency error occurs; this is caused by using a 60 Hz device on a 50 Hz line, or vice versa on devices with a date code earlier than 9804.
INITIATE HOLD: (AC Line Dropout)	The KDM indicates the burner status and that ac line power has momentarily dropped out. The burner sequence does not advance into STANDBY until the ac line voltage has stabilized throughout the INITIATE sequence.
INITIATE HOLD: (AC Frequency)	The KDM indicates the burner status and that line frequency is faster than the expected value. The burner sequence does not advance into STANDBY until the line frequency returns to the proper value; this is perhaps caused by using a 60 Hz device on a 50 Hz line for devices with a date code earlier than 9804.
INITIATE HOLD: (Low Line Voltage)	The KDM indicates the burner status and that low line voltage (10% lower than rated voltage) has occurred. The burner sequence does not advance into STANDBY until the line voltage is at a sufficient level for proper operating parameters.
STANDBY	The KDM indicates the burner status, STANDBY. The burner can be placed in STANDBY by opening the burner switch or if the operating controller indicates its setpoint is satisfied. If a demand is present for burner operation, the burner sequence does not advance from STANDBY to PURGE until the recycle limits close. If an Expanded Annunciator is connected, the display messages are enhanced.
If the relay module is in a	STANDBY HOLD status, the following conditions could exist:
STANDBY HOLD: F/G (Flame Detected)	The KDM indicates the burner status and that a flame is detected. A demand is present for burner operation. The sequence does not advance to PREPURGE until the flame signal clears. If the flame signal does not clear within 40 seconds, the relay module locks out.
STANDBY HOLD: T20 (Pre-Ignition Interlock)	The KDM indicates the burner status and that the Pre-Ignition Interlock is not closed. A demand is present for burner operation but the burner sequence does not advance to PREPURGE until the Pre-Ignition Interlock proves closed. If this time exceeds a 30 second hold, the relay module locks out.
STANDBY HOLD: T7 (Lockout Interlock)	The KDM indicates the burner status and that the Lockout Interlock is closed. A demand is present for burner operation but the burner sequence does not advance to PREPURGE until the Lockout Interlock proves open. If this time exceeds the 120 second hold, the relay module locks out.
STANDBY HOLD: T7 (Running Interlock) T17 for EC/RM7810, 7820, 7830, 7850 devices	The KDM indicates the burner status and that the Running Interlock is closed. A demand is present for burner operation, but the burner sequence does not advance to PREPURGE until the Running Interlock proves open. If this time exceeds the 120 second hold, the relay module locks out.

HONEYWELL Keyboard Display Module Sequence and Status Hold Messages (cont'd)

Sequence	Status
PURGE	The KDM indicates the burner status, PURGE, which is the period of time the blower motor is running before the Ignition period. The timing of the PURGE period is selectable.
If the relay module is in a	PURGE HOLD status, the following conditions could exist:
PURGE HOLD: T19 (High Fire Switch)	The KDM indicates the burner status and that the High Fire Switch is not closed. The firing rate motor is driving to its PURGE rate position. If this time exceeds 4 minutes 15 seconds, the relay module locks out.
PURGE DELAY: T19 (High Fire Switch Jumpered)	The KDM indicates the burner status and that the High Fire Switch is jumpered. The High Fire Switch is bypassed, welded or otherwise prematurely closed. The system automatically adds 30 seconds to allow the firing rate motor additional drive time to reach or near the open damper position before starting the PURGE sequence.
PURGE HOLD: TEST (Run/Test Switch)	The KDM indicates the burner status and that the Run/Test Switch is in the TEST position. The sequence does not continue until the Run/Test Switch is placed in the RUN position.

If the relay module is in a PURGE HOLD status, the following conditions could exist:

1	
PURGE HOLD: T18 (Low Fire Switch Jumpered)	The KDM indicates the burner status and that the Low Fire Switch is jumpered. The Low Fire Switch is bypassed, welded or otherwise prematurely closed. The system automatically adds 30 seconds to allow the firing rate motor additional drive time to reach or near the closed damper position before starting the ignition sequence.
PURGE HOLD: F/G (Flame Detected)	The KDM indicates the burner status and that a flame is detected. The burner sequence does not advance through PREPURGE because a flame is detected as being present. The sequence holds waiting for the flame signal to clear. If the time exceeds 30 seconds, the relay module locks out.
PURGE HOLD: T18 (Low Fire Switch)	The KDM indicates the burner status and that the Low Fire Switch is not closed. The firing rate motor is driving to its Low Fire position in preparation for Ignition Trials. If this time exceeds 4 minutes 15 seconds, the relay module locks out.
PURGE HOLD: T7 (Running Interlock)	The KDM indicates the burner status and that the Running Interlock is not closed. The sequence does not advance to Ignition until the Running Interlock proves closed. If this time exceeds 30 seconds, the relay module locks out.
PILOT IGN mm:ss	The KDM indicates the burner status, PILOT IGN, and the timing of the PILOT IGN trial begins, in seconds. During this period, the relay module permits the pilot valve to open and the pilot flame to establish.

If the relay module is in a PILOT HOLD status, the following condition could exist:

PILOT HOLD: TEST (Run/Test Switch)	The KDM indicates the burner status, PILOT IGN, and that the Run/Test Switch is in the TEST position. The sequence does not continue until the Run/Test Switch is placed in the RUN position.
MAIN IGN mm:ss	The KDM indicates the burner status, MAIN IGN, and the timing of the MAIN IGN trial begins, in seconds. During this period, the relay module permits the main valve to open and the main flame to establish.
RUN	The KDM indicates the burner status, RUN, which is the period of time after the Ignition Trials and before the operating controller setpoint is reached. During this time, the burner is firing under control of the firing rate control.
If the relay module is in a	RUN HOLD status, the following condition could exist:
RUN LOWFIRE: TEST (Run/Test Switch)	The KDM indicates the burner status and that the Run/Test Switch is in the TEST position. Normal modulation or operation does not continue until the Run/Test Switch is placed in the RUN position.
POSTPURGE mm:ss	The KDM indicates the burner status, POSTPURGE, which is the period of time after the RUN period when the blower motor continues to run. The timing of the POSTPURGE period is fifteen seconds.
Waiting for connection	The KDM has power but is waiting to receive a signal from the relay module to continue operation.
RESET/ALARM TEST	The KDM indicates the burner status, RESET/ALARM TEST. This condition indicates that the reset button is pressed. If it is held for more than four seconds, the alarm output is energized. The alarm output is de-energized when the reset button is released.
Additional sequence statu	is information when an expanded annunciator is connected to the relay module:
BURNER OFF: T6 (Burner Switch) STANDBY	The KDM indicates the Burner Switch is not closed. The burner sequence does not advance to PREPURGE until the Burner Switch closes.
STANDBY	The KDM indicates the burner status, STANDBY, and that the Operating Control is not closed. The burner sequence does not advance to PREPURGE until the Operating Control closes.
STANDBY HOLD: T6 (EA Hold Message)	The KDM indicates the burner status, STANDBY, and that a limit is not closed. The burner sequence does not advance to PREPURGE until one or all limits close downstream from the Operating Control.
STANDBY HOLD: T6 (Circuit Fault)	The KDM indicates the burner status, STANDBY, and that the control input is not closed. The burner sequence does not advance to PREPURGE until the control input closes.

NOTE: Normal sequences are in bold type, while abnormal sequences are in regular type. This table is for all 7800 SERIES Relay Modules, so all listed steps may not apply to the unit installed.

Fault Code	System Failure	Recommended Troubleshooting
Fault 1 *No Purge Card*	No card is plugged into the purge card slot.	 Make sure the purge card is seated properly. Inspect the purge card and connector on the relay module for damage or contaminants. Reset and sequence the relay module. If the fault code reappears, replace the purge card. Reset and sequence the relay module. If the fault persists, replace the relay module.
Fault 2 *AC Frequen/Noise*	Excess noise or device running on slow ac.	 Check the relay module and display module connections. Reset and sequence the relay module.
Fault 3 *AC Line Dropout*	Ac line dropout detected.	 Check the relay module power supply and make sure that both fre- quency and voltage meet the specifications.
Fault 4 *AC Frequency*	Device running on fast ac.	 Check the backup power supply, as appropriate.
Fault 5 *Low Line Voltage*	Low ac line detected.	
Fault 6 *Purge Card Error*	Purge card timing changed since card was initially read.	 Make sure the purge card is seated properly. Inspect the purge card and connector on the relay module for damage or contaminants. Reset and sequence the relay module. If the fault code reappears, replace the purge card. Reset and sequence the relay module. If the fault persists, replace the relay module.
Fault 7 *Flame Amplifier*	Flame sensed when flame not present.	 Check wiring and correct any errors. Make sure that flame sensor wires are in separate conduits. Check for noise coupling into the flame
Fault 8 *Flame Amp/Shutr*	Flame sensed when no signal expected during shutter-check or Ampli-Check versions.	 detector leadwires. Make sure that flame detector and flame amplifier are compatible. Remove the flame amplifier and inspect connections. Reseat the amplifier. Reset and sequence the relay module. If the code reappears, replace the amplifier and/or the flame detector. If the fault persists, replace the relay module.
Fault 9 *Flame Detected*	Flame sensed when shutter open and no flame is expected during STANDBY.	 Check that flame is not present in the combustion chamber; correct any errors. Check wiring and correct any errors. Make sure that flame sensor wires are in separate conduits. Check for noise coupling into flame detector leadwires. Remove the flame amplifier and inspect its connections. Reseat the amplifier. Reset and sequence the relay module. If the code reappears, replace the amplifier and/or the flame detector. If the fault persists, replace the relay module.
Fault 10 *Pre-Ignition ILK*	Pre-Ignition Interlock fault during STANDBY *EC/ RM7800, 7840, 7838B only).	 Check wiring and correct any errors. Check Pre-Ignition Interlock switches to assure proper functioning. Check fuel valve operation. Reset and sequence the relay module; monitor the Pre-Ignition Interlock status. If the code persists, replace the relay module.
Fault 11 *Running ILK On*	Running Interlock powered at improper sequence point.	 Check wiring to make sure that interlocks are connected properly between terminals 6 and 7. Correct any errors.
Fault 12 *Lockout ILK On*	Lockout Interlock powered at improper point in sequence.	 Reset and sequence the relay module. If the fault persists, measure the voltage between terminals 6 and G (ground), then terminals 7 and G. If there is line supply voltage present at terminal 6.
Fault 13 *Airflow Sw. On*	Combustion airflow interlock fault during STANDBY.	 when the controller is off, the controller switch may be bad or is jumpered. If steps 1 through 3 are correct and there is line supply voltage present at terminal 7 when the controller is closed and the fault persists, check for a welded or jumpered Running Interlock, Lockout Interlock, or Airflow Switch. Correct any errors. If steps 1 through 4 are correct and the fault persists, replace the relay module.

Fault Code	System Failure	Recommended Troubleshooting
Fault 14 *High Fire Sw.*	High Fire Interlock Switch failure to close during PREPURGE.	 Check wiring and correct any errors. Reset and sequence the relay module. Use either the manual motor potentiometer to drive the motor to the High Fire position or use the Run/Test Switch option, if available. Sequence to Prepurge drive to High Fire and place in the Test position. Adjust the High Fire Switch while in this state to make sure that it closes properly. Measure the voltage between terminal 19 and G (ground) while in the Prepurge drive to High Fire state. Line supply voltage should be present. If not, the switch adjustment is incorrect and/or the switch is defective and needs replacing. Reset and sequence the relay module. If line supply voltage was present between the High Fire Switch and terminal 19, and the fault still persists, replace the relay module.
Fault 15 *Flame Detected*	Flame sensed when no flame is expected during STANDBY.	 Check that the flame is not present in the combustion chamber; correct any errors. Make sure that the flame amplifier and flame detector are compatible. Check wiring and correct any errors. Remove the flame amplifier and inspect the connections. Reseat the amplifier. Reset and sequence the relay module. If the code reappears, replace the amplifier and/or the flame detector. If the fault persists, replace the relay module.
Fault 16 *Flame-Out Timer*	No flame detected during Pilot Flame Establishing Period.	 Measure the flame signal. If one exists, make sure it meets specifications. Make any necessary burner adjustments using manufacturer instructions. Make sure that the flame amplifier and flame detector are compatible. If the code reappears, replace the amplifier and/or the flame detector. If the fault persists, replace the relay module.
Fault 17 *Main Flame Fail*	Main flame failure during RUN after flame is established and on for at least 10 seconds.	 Inspect the main fuel valve(s) and connection(s). Make sure that the fuel pressure is high enough to supply fuel to the combustion chamber. Check the flame detector sighting for adequate flame signal throughout the burner firing rate.
Fault 18 *Flame Detected*	Flame sensed when shutter is open and no flame is expected during PREPURGE.	 Check that flame is not present in the combustion chamber. Correct any errors. Make sure that the flame amplifier and flame detector are compatible. Check the wiring and correct any errors. Make sure F and G wires are in individual conduits and protected from stray noise pickup. Remove the flame amplifier and inspect the connectors. Reseat the flame amplifier. Reset and sequence the relay module. If the code reappears, replace the flame amplifier and/or the flame detector. If the fault persists, replace the relay module.
Fault 19 *Main Flame Ign.*	Flame was lost during MFEP or the first 10 seconds of the RUN state.	 Inspect the main fuel valve(s) and connection(s). Make sure that the fuel pressure is high enough to supply fuel to the combustion chamber. Make sure the flame detector is positioned to obtain the required flame signal strength; reset and recycle.
Fault 20 *Low Fire Sw. Off*	Low Fire Interlock switch failure to close during PREPURGE.	 Check wiring and correct any errors. Reset and sequence the relay module. Use either the manual motor potentiometer to drive the motor to the Low Fire position or use the Run/Test Switch option, if available. Sequence to Prepurge drive to Low Fire and place in the Test position. Adjust the Low Fire Switch to make sure that it closes properly. Measure the voltage between terminal 18 and G (ground) while in the Prepurge drive to Low Fire state. Line supply voltage should be present. If not, the switch adjustment is incorrect and/or the switch is defective and needs replacing. Reset and sequence the relay module. If line supply voltage was present between the Low Fire Switch and terminal 18, and the fault still persists, replace the relay module.

Fault Code	System Failure	Recommended Troubleshooting
Fault 21 *Running ILK* Fault 22 *Lockout ILK* Fault 23 *Airflow Switch*	Running Interlock fault during PREPURGE. Lockout Interlock fault during PREPURGE. Combustion airflow interlock fault during PREPURGE.	 Check wiring; correct any errors. Inspect the fan; make sure there is no blockage of the air intake and that it is supplying air. Make sure the Interlock Switches are working properly and that all switch contacts are free of contaminants. Reset and sequence the relay module to PREPURGE (place the Run/Test Switch in the Test position, if available). Measure the voltage between terminals 7 and G (ground). Line voltage should be present. If steps 1 through 4 are correct and the fault persists, replace the relay module.
Fault 24 *Call Service* Fault 25 *Call Service*	The flame interlock (relay module) was on when it should be off. The flame interlock (relay module) was off when it should be on.	 Check for F leadwire routing. Make sure routing is in its conduit and isolated from noise-producing circuits.
Fault 26 *Man-Open Sw. Off*	The Manual Open Valve Switch was off when it should be on (RM7838B only).	 Check wiring and correct any errors. Make sure that the Manual Open Valve Switch is fully open. Make sure that the Manual Open Valve Switch is functioning properly and that the switch contacts are free from contaminants. Reset and sequence the relay module. Make sure that the Manual Open Valve Switch provides an electrical path when closed. Verify that the relay module is receiving power at terminal 17. If steps 1 through 5 are correct and the fault persists, replace the relay module.
Fault 27 *Start Switch On*	Start Switch was on during PREPURGE (RM7838A, RM7838B only).	 Start Switch held on too long. Check wiring; verify that Start Switch is correctly connected. Make sure that the Start Switch is functioning properly and that the switch contacts are free of contaminants. Reset and sequence the relay module to PREPURGE; set the Run/Test Switch to Test. Make sure there is no power at terminal 6 during PREPURGE. If steps 1 through 3 are correct and the fault persists, replace the relay module.
Fault 28 *Pilot Flame Fail*	Pilot flame failure.	 Check pilot valve wiring and operation. Correct any errors. Check fuel supply. Check pilot pressure and repeat pilot turndown test. Check ignition transformer electrode, flame detector, flame detector sighting and flame amplifier. If steps 1 through 4 are correct and the fault persists, replace the relay module.
Fault 29 *Lockout ILK*	Lockout Interlock fault.	 Check wiring; correct any errors. Inspect the fan; make sure that there is no blockage of the air intake and that it is supplying air. Make sure that the Lockout Interlock Switches are working properly and that all switch contacts are free of contaminants. Reset and sequence the relay module to PREPURGE (place the Run/Test Switch in the Test position, if available). Measure the voltage between terminals 7 and G (ground). Line voltage should be present. If steps 1 through 4 are correct and the fault persists, replace the relay module.
Fault 30 *Running ILK*	Running Interlock fault.	 Inspect the Running Interlocks, including the Airflow Switch, and the connections. Make sure that the Running Interlocks, including the Airflow Switch, are functioning properly and that switch contacts are free of contaminants. Reset and sequence the relay module to PREPURGE. Set the Run/Test Switch, if available, to Test. Measure the voltage between terminal 7 and G (ground). Line voltage should be present. If steps 1 through 3 are correct and the fault persists, replace the relay module.

Fault Code	System Failure	Recommended Troubleshooting
Fault 31 *Low Fire Sw. Off*	Low Fire Interlock Switch failure to close during RUN (RM7838B only).	 Check wiring; correct any errors. Reset and sequence the relay module. Use either the manual motor position to drive the motor to the Low Fire position, or use the Run/Test Switch option, if available. Sequence to Run drive to Low Fire and place in the Test position. Adjust the Low Fire Switch while in this state to make sure it is closing properly. While in Run, drive to Low Fire state, measure the voltage between terminal 18 and G (ground). Line voltage should be present. If not, the switch adjustment is incorrect and/or the switch is defective and needs replacement. Reset and sequence the relay module. If line voltage was present between the Low Fire Switch and terminal 18 and the fault persists, replace the relay module.
Fault 32 *Airflow Switch*	Combustion Airflow Interlock fault.	 Check wiring; correct any errors. Inspect the fan; make sure there is no blockage of the air intake and it is supplying air. Make sure the Airflow Interlock Switches are working properly and all switch contacts are free of contaminants. Reset and sequence the relay module to PREPURGE. Place the Run/Test Switch in the Test position, if available. Measure the voltage between terminals 7 and G (ground). Line voltage should be present. If steps 1 through 4 are correct and the fault persists, replace the relay module.
Fault 33 *Pre-Ignition ILK*	Pre-Ignition interlock fault.	 Check wiring; correct any errors. Inspect the Pre-Ignition Interlock switches and make sure they function properly. Check fuel valve operation. Valve must close within five seconds. Reset and sequence the relay module. During STANDBY or PREPURGE, measure the voltage between terminal 20 and G (ground). For EC/RM7810, 7820, 7830, 7850, check voltage between terminal 17 and G. Line voltage should be present. If not, the Pre-Ignition Interlock switches could be defective and need replacing. If the fault persists, replace the relay module.
Fault 34 *Control On*	CTL input was energized at the wrong time for the relay module. This fault implies a field wiring error.	 Check wiring; correct any errors. Reset and sequence the relay module. If fault persists, replace the relay module.

Appendix F: Control Panel Replacement Parts

Replacement Boards which include the Honeywell Flame Controller (3923-00006) are available.

Circuit Boards are also available as individual assemblies (Items 1, 2, 3 or 4).



	All Allen Brudey 1606-XLE Control of the Second
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Item	Description	BCT Part No.
1	CPU Board (Central Processing Unit)	3728-00083
2	24VDC / Analog Board	3728-00085
3	120VAC Board	3728-00082
4	Safety Board	3728-00084
5	Ground Lug, dual port	2513-00027
6	PPH MS M3-0.5 x 10z	2362-00060
7	Back Control Plate w/PEM	3923-00004
8	Control Circuit Breaker-SA	3926-00001
9	Allen Bradley AB1606-XLE Power Supply 24VDC	2563-00032
	HONEYWELL Assembly	
10	Flame Safety Pack RM7898A2018/U	2542-00087
11	Display, Digital S7800A2142/U	2542-00089
12	Ultraviolet Flame Amplifier	2542-00045
13	Purge Timer RM7895A 30-second	2542-00042
14	Mount Plate 7800 Honeywell Base	3723-00038
15	Base, 7800A2005/U	2542-00088

Figure 18. Intui-DRY® Control Section BCT

Appendix G: TrueGrain[™] Moisture Sensor Connections



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Safeguarding Your Grain® Since 1957

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Changes this issue: Schematics 3924-00062, 3924-00063, 3924-00064, 3924-00065 and 3924-00066 were added. Schematics 3924-00026, 3924-00044, 3924-00045, 3924-00051 and 3924-00054 were removed. Electrical Specifications were updated. Some graphics were updated.

Changes last issue: Page 26: Allen-Bradley Power Flex 15HP 575V Setup was added. Page 30: Intui-DRY® Schematic 3924-00028 changed to 3924-00044. Page 49: A diagram was added for wiring TrueGrain[™] into the Control Board. Schematic 3924-00023 was revised. Schematics 3924-00015, 3924-00027 and 3924-00051 were added. Schematic 3924-00029 was replaced with 3924-00045.



Use extreme CAUTION around electrical components. SHUT OFF, LOCKOUT and TAGOUT electrical power BEFORE opening or servicing this Dryer Disconnect. Keep Doors CLOSED during Dryer operation. Failure to do so will result in death or serious injury. Do not run with doors open. Do not use electrical cabinets for storage.

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