A Universal Replacement For IP Ignition Modules—The Honeywell S8610U Electronic Control Module

Introduction

The Honeywell S8610U Electronic Control Module was developed as a universal replacement module for single and dual rod intermittent pilot systems. This paper describes the features of the S8610U. It discusses the safety concerns raised by continuous retry controls like the S8610U, and briefly outlines some of the testing and analysis done by Honeywell regarding these concerns. The paper also explains how to decide if the module is an appropriate replacement for a particular application, and describes the Y8610U Retrofit Kit.

Advantages of Universal Replacements

Universal replacements provide dealers and service technicians with important advantages; they reduce the inventory that must be carried on the service vehicle and stocked at the shop; and they minimize the number of controls the service technician must master. Working with familiar controls on a routine basis allows the service technician to develop greater confidence in his or her ability to safely install, test, and troubleshoot the system. This results in faster, easier installations and fewer callbacks.

Features of the S8610U

The S8610U, Fig. 1, is a 24V electronic module for intermittent pilot systems. It has 100 percent shutoff with continuous retry and can be used with both natural gas and LP. The module is rated for combination gas controls with pilot valves up to one ampere and main valves of up to two amperes. The S8610U has ignition and flame sensing circuitry that accommodates either a combination igniter-sensor (single-rod) or separate igniter and sensor (dual-rod). A vent damper plug is standard. Although there is no formal prepurge cycle, the module does have a short initial delay before the ignition sequence and can be used to replace systems with a four second or less prepurge.

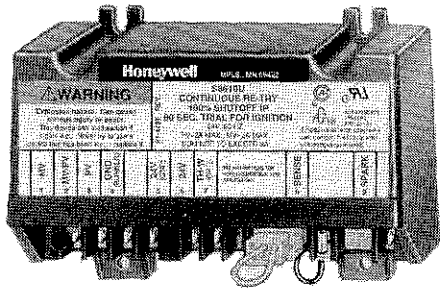

Fig. 1—The S8610U Electronic Control Module.

THE SOURCE

One feature that allows the S8610U to serve as a universal replacement module is its unique continuous retry sequence, which provides safe control in applications using either natural or LP gas. On a call for heat, the S8610U begins a 90 second (nominal) trial for ignition. If the pilot flame is not sensed within this period, the S8610U de-energizes the pilot valve and shuts off the spark. The S8610U waits for five minutes (nominal) to allow venting of accumulated gas, and then the trial for pilot ignition begins again. Retries continue until ignition is successful or the call for heat is removed.

It is important to remember that only *pilot* gas flows during trials for ignition in an intermittent pilot system. *Main* gas never flows until after the pilot is lit. Our studies have shown that even in the case of LP gas, there is not enough accumulation of pilot gas to present an explosion hazard under even the most severe conditions. See Standards and System Safety below.

Furnace and boiler manufacturers are implementing continuous retry modules like the S8610U because they have a significant advantage over controls with lockout timing. Without lockout timing, shutdowns due to temporary problems like short-term utility interruption and temporary drafts are virtually eliminated. With a continuous retry controller, the system resumes normal operation as soon as the temporary problem disappears. At the same time, the five minute delay between trials allows unburned pilot gas to dissipate, which provides a safer, quieter lightoff. The end result is less service time spent troubleshooting temporary, often uncontrollable problems.

There is a standards difference between furnaces and boilers using intermittent pilot ignition. The furnace standard calls for 100 percent shutoff on both natural and LP. The boiler standard calls for 100 percent shutoff on LP only. However, even though 100 percent shutoff is not required on natural gas boilers, many boiler manufacturers have historically used 100 percent lockout models on both natural and LP gas. Many of these same manufacturers are not switching to the continuous retry concept on new boilers. The recycle time inherent in continuous retry makes the S8610U a suitable replacement for lockout controls on either natural or LP gas and in either furnaces or boilers when as the guidelines in the installation instructions are followed.

A second feature of the S8610U that makes it a universal replacement module is its ability to handle both single-rod and dual-rod ignition/sensing hardware. The module is shipped for use with single-rod systems. To convert it for use in dual-rod systems, remove the jumper from the sense terminal and cut it off close to the circuit board as shown in Fig. 2.

REMOVE JUMPER WIRE FOR TWO-ROD SYSTEMS

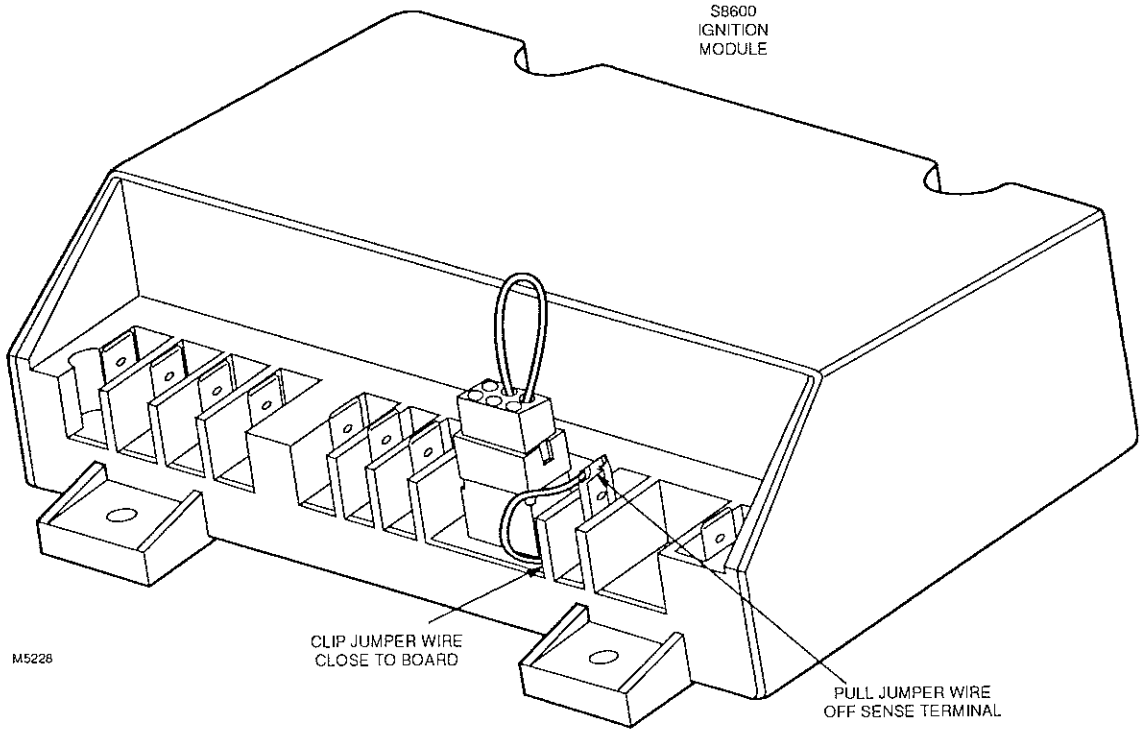

Fig. 2—Remove the jumper to convert the S8610U for use on dual-rod systems.

The S8610U was designed to be easy to install as well as universally applicable. The module comes with two terminal adapters. One is an adapter that allows the use of existing ignition cable with a Rajah connection. The other is an insulated quick connect that allows the use of other existing ignition cables. Also supplied are solderless connectors and a set of tags for labeling wires as they are removed from the existing control so that they can be easily identified and properly connected to the S8610U.

Detailed installation instructions provided with the module include wiring diagrams, cross-reference information, and checkout procedures.

Standards And System Safety

Standards for furnaces (Z21.47) and boilers (Z21.13) specify that lockout is required only for direct ignition (DI) systems. These standards require that intermittent pilot (IP) systems provide 100 percent *shutoff* after the trial for ignition, but do not require lockout. Continuous retry is acceptable under the standards applicable to intermittent pilot appliances.

Whereas DI systems allow main burner gas to flow, IP systems only allow pilot gas to flow until the pilot flame is established.

One concern that might be raised by modules like the S8610U, however, is that the continuous retry sequence might allow a dangerous accumulation of gas to collect in the appliance, especially in appliances using LP. Honeywell testing has found that this is not true.

Because only pilot gas flows during the trial for ignition, the system is safe even with LP gas. Extensive tests showed that even with LP gas venting into a sealed closet, an explosion hazard did not develop even after 20 hours of continuous pilot flow at the rate of 0.85 cfh, which is more than twice the flow from a typical LP gas pilot burner.

The testing procedures and results follow.

TEST SETUP

Gas accumulation from continuous pilot flow (without ignition) was tested using both induced draft and natural draft appliances. The appliances were mounted in an enclosure simulating a closet application. Both LP and natural gas were tested.

The closet used to enclose the test furnace was made of plywood and measured 2-1/2 x 4 x 7-1/2 feet. Sampling tubes were installed at various locations to extract samples for analysis by a nondispersive infrared (NDIR) gas analyzer. The access door to the closet had two openings, each one square foot in area. One opening was at the top and one at the bottom. The openings provided ventilation and combustion air. For the *worst case* test, these openings were sealed.

RESULT

With the induced draft appliance, no measurable accumulation of either natural or LP gas was observed, even when the openings were sealed. This was expected because the induced draft blower tends to vent any gas leaking into the combustion chamber.

With the natural draft appliance using natural gas, accumulation was never greater than 0.1 percent, which is insignificant considering that the lower explosive limit of natural gas is at about 5 percent concentration. Again, this is expected because natural gas is lighter than air and tends to vent up the stack.

The greatest accumulation occurred using LP gas with the natural draft appliance when the openings in the closet door were sealed. The test was run using 0.85 cfh gas flow, even though normal gas flow from an LP pilot is about 0.4 cfh. The results of this test are graphed in Fig. 3. Because LP gas is heavier than air, the maximum concentration after a steady state condition achieved (approximately two hours into the test) was close to the floor. This concentration was still less than the 2 percent lower explosive limit for LP gas. Had the flow been the 0.4 cfh normal flow to these systems, the maximum concentration expected would have been less than 1 percent.

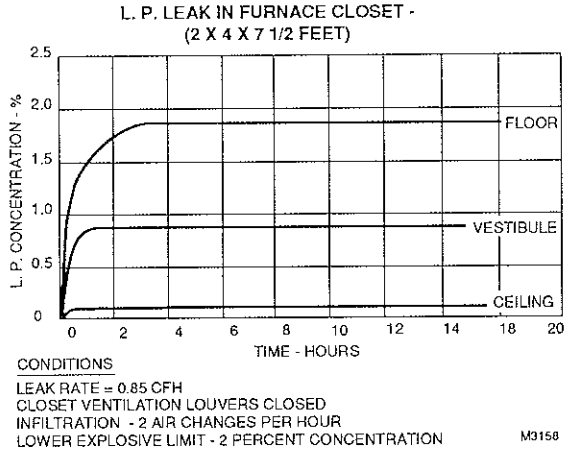

Fig. 3—LP gas accumulation in a sealed closet.

After the results in Fig. 3 were obtained, the openings in the top and bottom of the door to the furnace closet were opened. The LP flow was continued at 0.85 cfh. After about 1.5 hours (the approximate time it took to reach the steady state condition), the concentration of LP on the floor had been reduced from 1.9 percent to 0.45 percent.

The concentrations in the vestibule and on the ceiling were also reduced. As expected, the worst conditions for accumulating LP gas in the furnace enclosure existed when the openings in the closet door were sealed.

These results show conclusively that the small amount (up to 1.3K Btu/hr) of escaping natural or LP pilot gas will not create an explosive mixture and therefore poses no threat to the equipment, service technicians or building occupants.

When to Use the S8610U

Appendix A lists more than 250 Honeywell and competitive modules that can be replaced with the S8610U. While this is an extensive list, it should not be considered inclusive. The S8610U can be applied safely on virtually any system that has a prepurge less then four seconds long and a trial for ignition that is at least 30 seconds in duration. The module meets requirement for 100 percent shutoff. As always, attention to specific system requirements and possible modifications is required before installing a replacement module. Be sure to check with your local Honeywell representative before replacing a control module that is not included in Appendix A. Refer to the Robertshaw wiring diagram, Table 1 in Appendix A, for an example of the information available to make replacing the S8610U as easy as possible.

The S8610U *should not be used* to replace controls that have lockout timing less than 30 seconds or that have pilots with ratings above 1500 Btu/hr. These specifications are typically found on appliances used in commercial applications and are regulated under different standards than those that apply to the S8610U. Using the S8610U on such appliances is outside its design parameters.

Y8610U RETROFIT KIT

Because of the versatility of the S8610U, it has been incorporated into a new retrofit kit. The Y8610U Retrofit Kit, Fig. 4, includes all the hardware necessary to replace virtually any IP system and to retrofit standing pilot systems to IP use. The kit includes the S8610U Electronic Control Module, a VR8304M Gas Control, a wiring harness and ignition cable, a combination igniter-sensor, an LP conversion

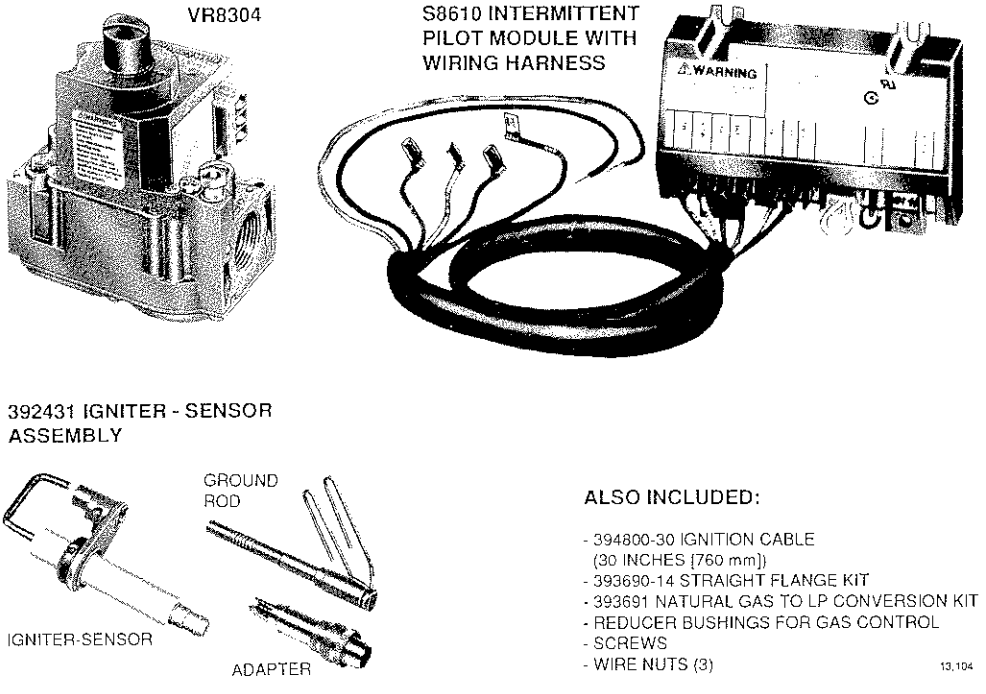

Fig. 4—Components of the Y8610U Retrofit Kit.

kit, a flange kit and complete instructions for installation. Also included are lighting instructions for the homeowner and a homeowner's guide.

SUMMARY

Honeywell's first IP device was introduced in 1979. Since then, our controls have been continuously improved to provide safer, more efficient operation and the broadest range of applications. The S8610U and its complement, the Y8610U Retrofit Kit, are just two solutions to the ever-growing problem that dealers and installers encounter of an ever-expanding inventory and the attendent problems of providing parts to the job site and properly training service technicians.

APPENDIX

Page 6: Listing of Honeywell and other manufacturer's IP modules that can be replaced by the S8610U.

Page 7: Table 1, sample wiring conversion table for Robertshaw modules that can be replaced by the S8610U. The installation instructions include wiring conversion tables for all modules that can be replaced by the S8610U.

CAMSTAT
IPI-24-00

FENWAL
05-203025-005
05-203026-005

HONEYWELL
S86A1001
S86A1019
S86A1027
S86A1035
S86B1009
S86B1017
S86B1025
S86C1007
S86C1015
S86C1031
S86C1049
S86C1056
S86D1005
S86D1021
S86E1002
S86E1010
S86E1028
S86E1036
S86E1044
S86E1051
S86E1069
S86E1077
S86E1101
S86E1119
S86E1127
S86F1000
S86F1018
S86F1026
S86F1042
S86F1059
S86F1067
S86F1075
S86F1083
S86F1091
S86G1008
S86G1016
S86G1032
S86G1057
S86G1073
S86H1006
S86H1022
S86H1048
S86H1089
S86H1097
S86H1105
S86H1121
S86H1147
S90A1005
S90B1003
S90B1011
S8600A1001
S8600B1009
S8600C1015
S8600F1000
S8600F1034
S8600F1042
S8600H1006
S8600H1022
S8600H1048
S8600H1055
S8600H1089
S8600H1105
S8600M1005
S8600M1013
S8610A1009
S8610B1007
S8610B1015
S8610C1005
S8610F1008
S8610F1016
S8610F1024
S8610F1032
S8610H1012
S8610H1038
S8610H1046
S8610H1053
S8610H1079
S8610M1003
S8610M1029
S8620H1028

HSC
1003-3
1003-300

PENN-JOHNSON
CSA35A-617R
CSA35A-618R
CSA42A-600R
CSA42A-601R
CSA42A-603R
CSA42A-604R
CSA43A-600R
CSA44A-600R
CSA45A-601R
CSA45A-602R
CSA46A-600R
CSA48A-600R
CSA49A-600R
CSA49A-605R
CSA51A-601R
CSA52A-600R
G60AAA-1
G60AAG-1
G60AAG-3
G60AAG-4
G60AAG-5
G60AAG-6
G60CAA-1
G60CAA-3
G60CAG-1
G60CAG-2
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G60CAG-4
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G60CAG-6
G60CAG-7
G60CAG-8
G60CAG-9
G60CBA-1
G60CBA-3
G60CBG-1
G60CBG-10
G60CBG-11
G60CBG-14
G60CBG-16
G60CBG-17
G60CBG-3
G60CBG-4
G60CBG-9
G60CCA-1
G60CCG-1
G60CPG-1
G60DBG-1
G60DCG-1
G60DCG-2
G60PAG-1
G60PAG-2
G60PAG-3
G60PAG-4
G60PAG-5
G60PAG-6
G60PAJ-1
G60PAK-1
G60PAK-2
G60PFH-1
G60PFH-2
G60PFL-1
G60PFQ-1
G60PVL-1
G60QAG-2
G60QAG-3
G60QAK-1
G60QBG-1
G60QBG-2
G60QBG-3
G60QBG-4
G60QBG-5
G60QBG-6
G60QBG-7
G60QBG-8
G60QBG-9
G60QBH-1
G60QBK-1
G60QBK-3
G60QBL-1
G60QBL-2
G60QCG-1
G60QCJ-1
G60QCL-1
G60QDG-1
G60QFL-1
G60QHL-1
G60QJL-1
G60QLG-1
G60QPL-1
G60QRH-1
G60QRL-1
G60QRL-2
G60QRL-3
G60QSL-1
G60QTH-1
G60QTL-1
G60RAG-1
G60RAK-1
G60RBG-1
G60RBG-2
G60RBG-3
G60RBK-1
G60RBK-2
G60RCG-2
G60RCJ-1
G60RDG-1
G60RDK-1
G60RGL-1
G60RHL-1
G60RHP-1
G60RPL-1
G60RSL-1
G60ZAG-1
G65BBG-1
G65BBG-2
G65BBG-3
G65BBG-4
G65BBG-5
G65BBG-6
G65BBG-7
G65BBG-8
G65BBM-1
G65BBM-2
G65BBM-3
G65BBM-4
G65BCG-1
G65BCM-1
G65BFG-1
G65BFM
G65BKG-1
G65BKG-2
G65BKG-3
G65BKM-1
G65BKM-2
G65BKM-3
G65DBG
G65DBM-1
G65DBM-3
G65DCM-1
G65DFG
G65DFM-1
G65DKG
G65DKM
G65FBG
G65FFG
G65FKG
G66AG-1
G66BG-1
G66MG-1
G66NG-1
G67AG-3
G67AG-4
G67AG-7
G67AG-8
G67BG-2
G67BG-3
G67BG-4
G67BG-5
G67MG-1
G67MG-4
G67NG-2
G600AX-1
G600AY-1
G600MX-1
G600NX-1
G600RX-1
G670AW-1
G770MGA-1
G770MGA-2
G770MGC-1
G770MGC-2
G770MGC-3
G770MHA-1
G770NGA-1
G770NGC-4
G770NGC-5
G770NGC-6
G770NGC-7
G770RGA-1
G770RHA-1
G770MHA-2
G770MHC-1
G770NHA-1
G770NHC-1
G770RHA-2

ROBERTSHAW
780-715
780-735
780-737
SP715
SP715A
SP735
SP735D
SP735L
USI 715U

NOTE: This list is for reference only. Honeywell reserves the right to add or delete models at any time, based on new or updated information. See the Installation Instructions packed with the S8610U for the most current list of models recommended for replacement.

TABLE 1—CONVERSION FROM ROBERTSHAW SP715 AND SP735[c] TO S8610U1003 (INCLUDES 780-XXX AND USI715U)[d]

1. Use existing wiring harness to make connections to S8610 per table. (**IMPORTANT:** If installation includes LO-15 Lockout Timer, discard wires to E3 and TH. Disconnect and retain wire to LO-15 terminal **E1**. Tag wire "Thermostat". Discard LO-15).
2. On 7000D series valve, retain (or install) white jumper between valve "TR" and pilot solenoid.

Terminal Function	Replacement Control Honeywell S8610U1003	Old Control Sp715 & Sp735 (All Models)[d]			Procedural Notes
		7000D Valve	7100D Valve	7100K Valve	
Main valve operator	MV	MV (to: Valve TH)	MV (to: Valve M)	MV (to: Valve TR)	
Main valve and pilot common	MV/PV	MV/PV (to: Valve TR)	MV/PV (to: Valve C)	MV/PV (to: Valve C and TH)	
Pilot valve operator	PV	PV (to: Valve PILOT)*	PV (to: Valve P)	PV (to: Valve PICK & HOLD)	*This is the terminal *not* jumpered to TR.
Burner ground connection	GND (BURNER)	GND	GND	GND	
Transformer secondary (unswitched leg)	24V GND	TR	TR	TR	
Transformer secondary (switched leg)	TH-W	TH	TH	TH	If LO-15 is part of the installation, use the wire disconnected from E1 tagged "Thermostat".
Flame sensor	SENSE[b]	SENSE[e]	SENSE[e]	SENSE[e]	
Pilot igniter	SPARK	IGN	IGN	IGN	
	24V	No connection	No connection	No connection	
		E3[a]	E3[a]	E3[a]	When supplied, E3 provides connection to Lockout Timer.

[a] If LO-15 Lockout timer is not installed, E3 connector provided on SP715 is not used.
[b] **IMPORTANT:** Remove black jumper quick connect from Sense terminal of S8610U1003. Cut jumper wire at circuit board and discard.
[c] For replacement of Robertshaw "Flame Switch" systems (SP710, 720, 730 , 750, 780-700, 780-701, 780-710, 780-711, 780-712 and 780-713), see Honeywell Ignition Control Handbook.
[d] 780-715 and USI 715U are equivalent to SP715; 780-735 and 780-737 are equivalent to SP735. For other 780-XXX models, see note[c].
[e] OPT. SENSOR on USI 715U. No external connection if combination Igniter/Sensor is used.

Honeywell

Home and Building Control
Honeywell Inc.
1985 Douglas Drive North
Golden Valley, MN 55422

Home and Building Control
Honeywell Limited—Honeywell Limitée
740 Ellesmere Road
Scarborough, Ontario
M1P 2V9

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