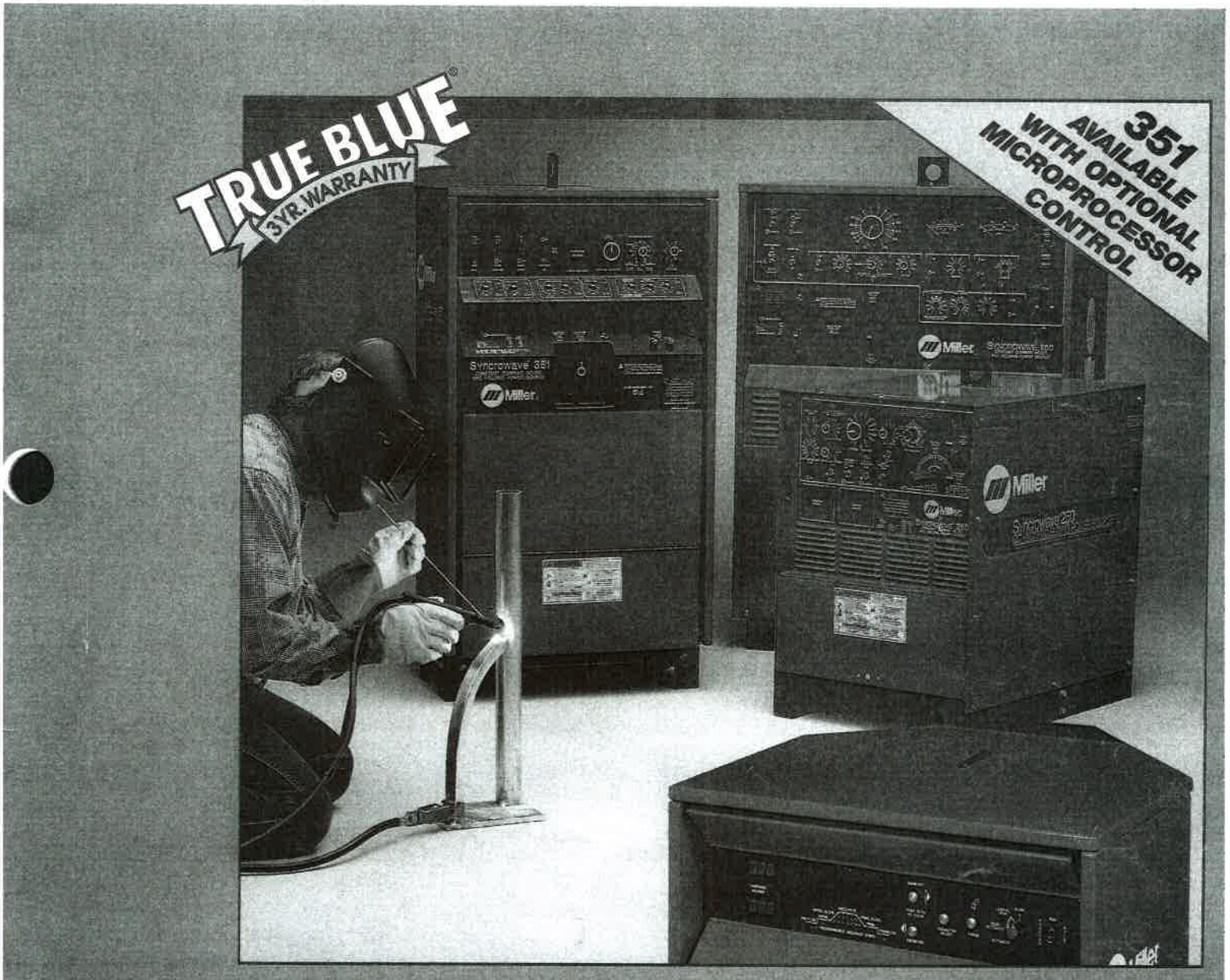
Index No. AD/4
Issued May 19

Miller®

SYNCROWAVE®

250, 350, and 500 Ampere, Squarewave™ AC/DC Constant Current Arc Welding Power Source

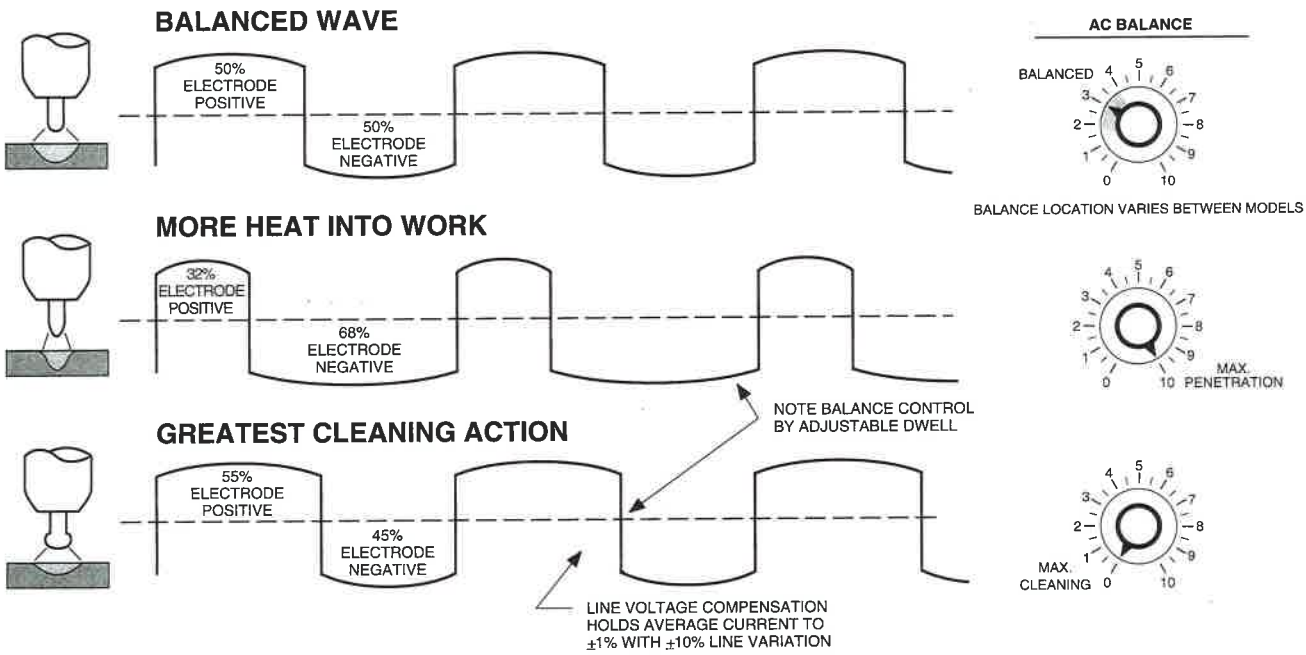


- Gas Tungsten Arc (TIG) Welding
- Shielded Metal Arc (Stick) Welding

SYNCROWAVE

The Syncrowave® power source is a single-phase, constant current (CC) Squarewave™ AC and DC arc welding power source designed for the Gas Tungsten Arc (TIG) Welding and Shielded Metal Arc (Stick) Welding processes. Offered in three different models, the Syncrowave family of power sources provides a choice of amperage ranges, machine sizes, and operating features and options, assuring that one of the models is suited for your application.

All Syncrowave models provide patented Miller Squarewave AC output with manually adjustable balance control for the most demanding AC jobs. The balance control features adjustable penetration and cleaning action while increasing arc stability on various aluminum alloys (refer to diagram below). This allows the operator to maximize the welding process to suit almost any application. The Squarewave AC output and balance control also help eliminate tungsten spitting and allows the use of smaller diameter tungsten electrodes to operate at higher current levels.



Balanced Wave Function

COMMON FEATURES

Syncrowave solid-state technology provides many benefits:

- **Squarewave design with AC balance control** provides a means for controlling penetration and cleaning action. Permits use of a higher amperage for a given electrode size without tungsten spitting
- **Remote control capabilities** allow the complete use of remote foot, fingertip, or torch-mounted amperage and contactor controls
- **14-socket receptacle** for use with foot and hand controls
- **Solid-state contactor** permits high-cycle operation without the maintenance problems associated with mechanical contactors
- **Line voltage compensation** allows the preset current to remain constant if the primary voltage supplied by the utility fluctuates (±10%)
- **Adjustable arc control** for optimum SMAW arc characteristics (250 and 351 only)
- **Wide amperage range** for greater flexibility
- **Internal high-frequency (HF) arc starter and stabilizer with intensity control** provides a means of positive, non-contact arc starting for the GTAW process
- **Three-position high-frequency switch** (Off/Start/Continuous)
- **Contactor-activated shielding gas solenoid valve and postflow timer** prevents atmospheric contamination of electrode and workpiece
- **Polarity changing switch** provides quick and easy way to change from one welding process to another without changing the secondary connections
- **Duplex 115 Volt, 2 KVA, AC receptacle** with 15 Amp circuit breaker
- **Miller's True Blue® Warranty: 3 Years** — parts and labor. Note: Original main power rectifier parts are warranted for 5 years.

SYNCROWAVE MODEL COMPARISON

SYNCROWAVE®250
- Light industrial
- Low-profile case design
- Single-range current control
- 5 to 310 Amps output
- Arc control for SMAW process
- Crater fill control
- Ⓢ Certified by Canadian Standards Association and Ⓤ listed by Underwriters' Laboratories

SYNCROWAVE®351
- Premium industrial
- Tall, "easy-access" case
- Three-turn current control
- 2 to 400 Amps output
- Arc control for SMAW
- Separate, presettable, lighted direct reading, digital voltage and amperage meters
- SMAW/GTAW process selector switch automatically activates functions relating to process chosen
- Can be easily upgraded through easy-to-install option modules
- Simplified control panel
- Compatible with *microprocessor* control option
- Quiet, dual-fan operation
- Air exchange through rear and out bottom of power source
- Retractable lifting eye
- Premium arc performance in all ranges and processes

SYNCROWAVE®500P
- Heavy-duty industrial
- Tall, "book shelf" style case
- Single-range current control
- 25 to 625 Amps output
- Start current control
- Crater fill control

SPECIFICATIONS (Subject to change without notice.)

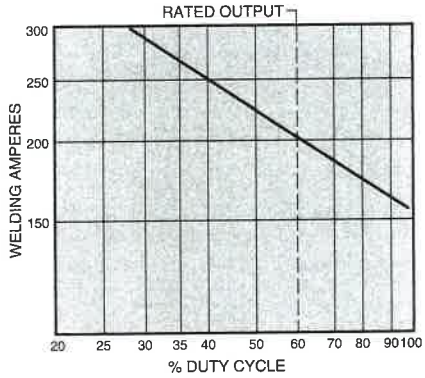
Model	Rated Output Amperes	Welding Range in Amperes	Max. Open Circuit Voltage	Power Factor Correction	Amperes Input at AC Balanced Rated Load 60 Hz Single-Phase 200V	230V	460V	575V	KVA	KW	Dimensions	Weight Net	Weight Ship
Syncrowave 250	NEMA Class II (40) 250 @ 30 Volts AC 40% Duty Cycle	5–310	80	without	105.8	92	46	36.8	21.2	11.4	Height: 30-3/4 in. (781 mm) Width: 19-1/4 in. (489 mm) Depth: 27 in. (686 mm)	355 lbs.* (161 kg)	365 lbs.* (166 kg)
				with	76	66	33	26.4	15.2	11.4			
	NEMA Class I (60) 200 @ 28 Volts AC 60% Duty Cycle			without	85	74	37	29.6	17	8.3			
				with	55.2	48	24	19.2	11	8.3			
Syncrowave 351	NEMA Class II (40) 350 @ 34 Volts 40% Duty Cycle	2–400	80	without	151	131	67	52	29.9	17.4	Height: 47-1/4 in. (1200 mm) Width: 24 in. (610 mm) Depth: 22-3/4 in. (578 mm)	549 lbs.** (312 kg)	585 lbs.** (318 kg)
				with	131	102	53	43	22	17.3			
	NEMA Class I (60) 300 @ 32 Volts 60% Duty Cycle			without	130	112	57	46	26.2	13.5			
				with	117	84	45	34	17.9	13.7			
Syncrowave 500P	NEMA Class I (60) 500 @ 40 Volts 60% Duty Cycle	25–625	80	standard	206	180	90	72	41.4	27	Height: 47 in. (1193 mm) Width: 31-1/4 in. (794 mm) Depth: 22-3/4 in. (577 mm)	875 lbs. (397 kg)	900 lbs. (408 kg)

Conforms with NEMA EW 1, "Electric Arc Welding Power Sources" Class I (60) and Class II (40)
Note: For primary input conductor and fuse sizes, consult the Owner's Manual or call the factory.
*Add 5 lbs. (2.3 kg) to models with power factor correction. **Add 8 lbs. (3.6 kg) to models with power factor correction.

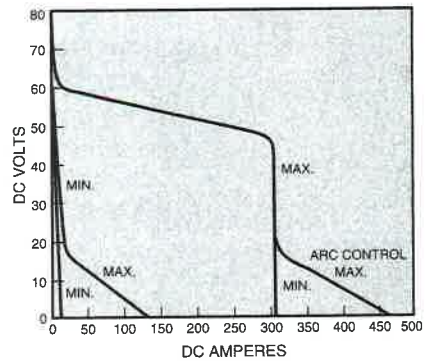
PERFORMANCE DATA

For Syncrowave® 250

DUTY CYCLE

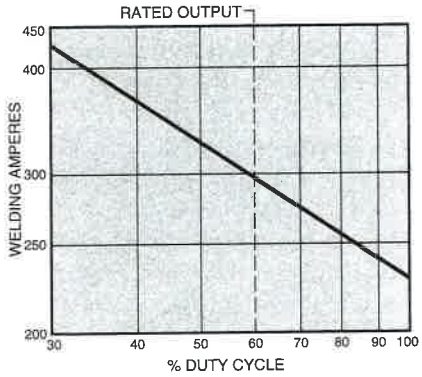


VOLT/AMP CURVE

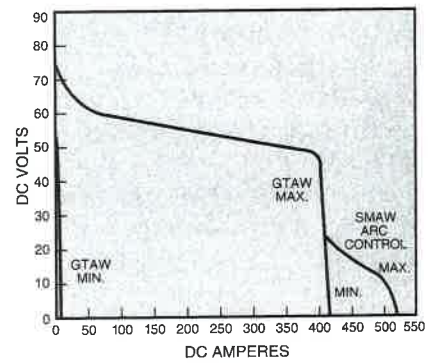


For Syncrowave® 351

DUTY CYCLE

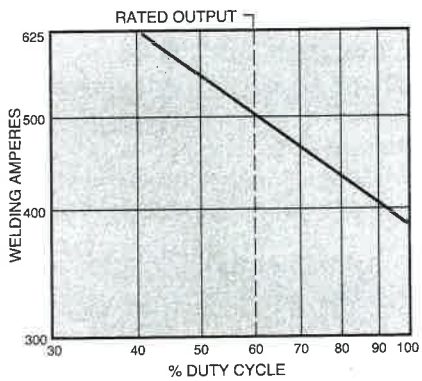


VOLT/AMP CURVE

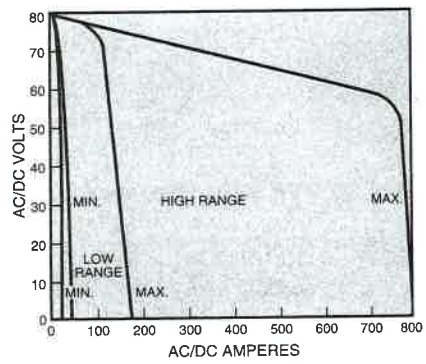


For Syncrowave® 500P

DUTY CYCLE



VOLT/AMP CURVE

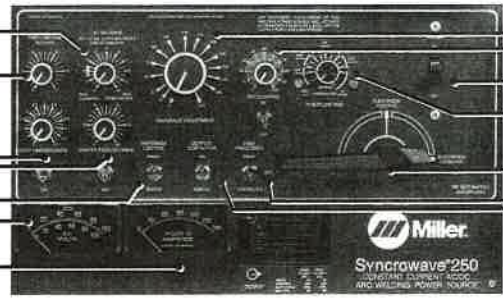


ORDERING INFORMATION

Voltage 60 Hz	SYNCROWAVE® 250	SYNCROWAVE® 351	*SYNCROWAVE 500P
200/230/460	(#903 056)	(#903 219)	(#902 403)
230/460/575	(#903 084)	(#903 220)	
Voltage 50 Hz			
220/380/415	(#903 203)	(#903 282)	(#903 235)
380/520	(#903 097)		

Note: For GTAW, the required remote control is not furnished and must be ordered separately.
Syncrowave 500P is standard with power factor correction.

SYNCROWAVE 250

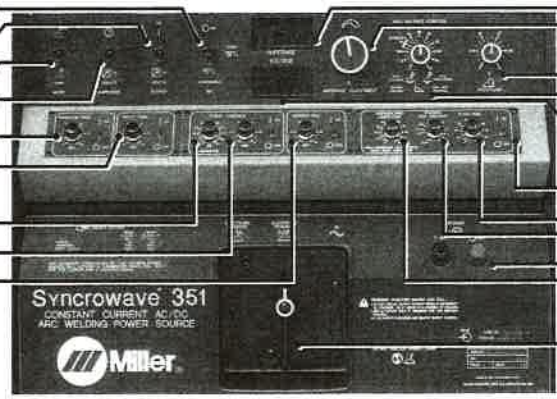


- AC Balance Control
- Preflow Time*
- Spot Timer/Seconds and On/Off*
- Crater Time and On/Off
- Amperage Control Panel/Remote
- Voltmeter*
- Ammeter*

*Optional

- Amperage Adjustment
- Arc Control
- Power On/Off Switch
- Postflow Timer
- Polarity Reversing/AC Selector
- High Frequency Start/Continuous
- Output Contactor Control On/Remote

SYNCROWAVE 351

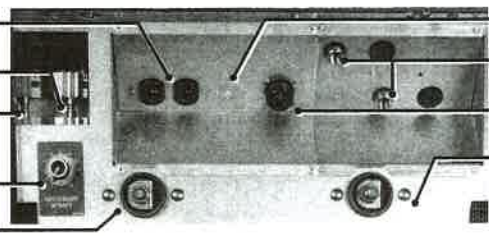


- High Frequency Switch
- Contactor Remote/Standard Switch
- SMAW/GTAW Switch
- Current Remote/Panel Switch
- Preflow Time Control*
- Spot Time Control*
- Start Current Control**
- Start Current Time**
- Crater Fill **

* Option Module #1
** Option Module #2
*** Option Module #3

- Digital Ammeter
- Amperage Adjustment
- Postflow Timer
- Arc/Balance Control
- Digital Voltmeter
- Pulser On/Off Switch
- Pulser % On Time Control***
- Pulses Per Second Control***
- Power On/Off
- Pulser Background Amperage Control***
- Polarity Reversing/AC Selector Switch

SYNCROWAVE 351 LOWER PANEL

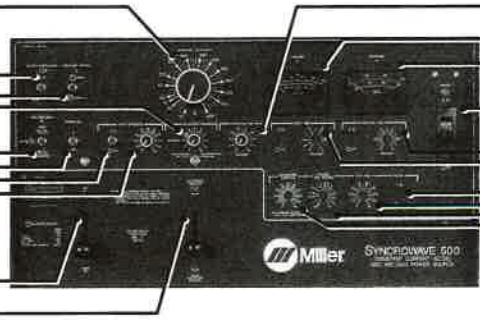


- 115 VAC Duplex Receptacle
- Spark Gap Point Access
- High Frequency Assemble (shown with cover removed)
- High Frequency Intensity Control
- Work

*Optional

- 15 Ampere Circuit Breaker
- Gas In/Out
- Remote 14-pin Receptacle
- Electrode

SYNCROWAVE 500

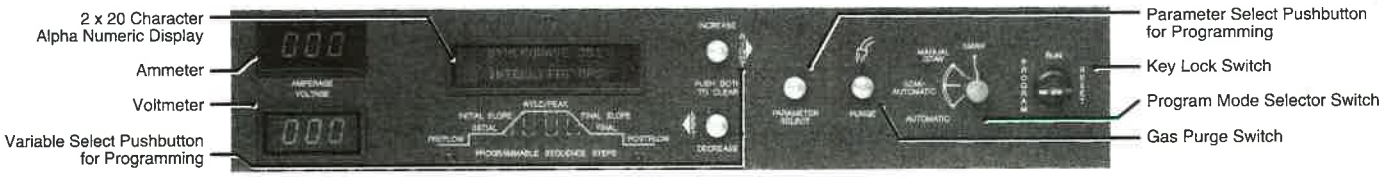


- Current Control
- Contactor Remote/Standard Switch
- Current Remote/Panel Switch
- AC Balance Control
- High Frequency
- Crater Fill
- Start Current Switch
- Start Current Rheostat
- AC/DC Selector Switch
- Polarity Switch

*Optional
†Necessary for Pulsing

- Postflow Timer
- Voltmeter
- Ammeter
- On/Off Switch
- Preflow Timer*
- Spot Timer*
- Pulser On/Off Switch*†
- Pulser % On Time*†
- Pulses-Per-Second*†
- Background Current*†

INTELLITIG MPC MICROPROCESSOR CONTROLLER



INTELLITIG™ MPC (MicroProcessor Controlled)
(#042 629 Factory)
For Syncrowave® 351 only.
Includes 15 ft. Remote Pendant.

Remote Pendant

Description: The Intellitig MPC controller replaces the entire front panel of the Syncrowave 351 power source. All timing and amperage control functions are controlled by a microprocessor. This controller is capable of storing the welding parameters that an operator has selected for a particular application. Four separate welding programs can be stored in each of the four operation modes. This ability to store parameters ensures precise, repeatable welds.

Easy Programming: The Intellitig MPC controller has an easy-to-follow programming format that prompts the operator through the programming steps via a lighted 2 x 20 character alphanumeric display. Depending on the programming mode chosen, the operator can program and control preflow time, initial amperage and time, initial slope time, welding current and time (depending on the program mode), final slope time, final current and time, and postflow time. The controller also has 9 timed-relay contacts available for use with equipment such as Programmable Logic Controllers (PLC), fixtures, wire feeders, rotational devices, etc.

"Dry Run" Program for Checking Parameters: The Intellitig MPC controller provides a "dry run" program feature that allows the operator to run through the entire program without starting the arc. The dry run program starts and displays the program clock as it counts down each timed event. The program also engages the timed relays, allowing the operator to observe the entire system in operation. The dry run program allows the operator to check and verify timed events before striking an arc, saving on the number of test parts required.

Two Formats for Programming Pulsing Parameters: Pulsing parameters can be programmed into the Intellitig MPC controllers using one of two formats. One format allows the operator to program a pulse frequency (0.1 Hz to 10 Hz), a percentage of peak amperage time, and a background current level. The second programming format provides more precise control of pulsing variables. Peak and background current and time for each can be programmed independently with time set in milliseconds. When these parameters are established, the microprocessor calculates and displays the resulting frequency. The operator selects the format using a dip switch located inside the control.

OPERATING FEATURES

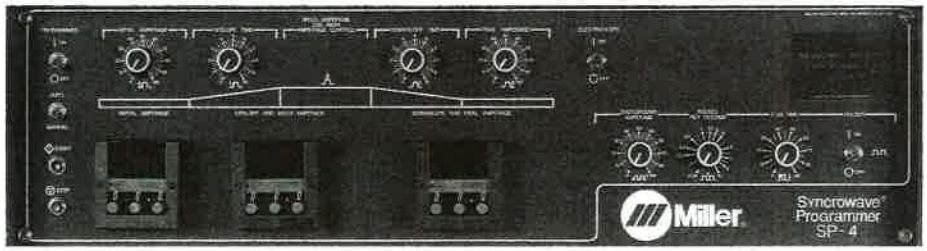
- Four-position rotary switch for selecting mode of operation
- 2 x 20 character alphanumeric digital display
- Normally open/normally closed (NO/NC) relay contacts for external fixtures
- Key-lock switch for programming and system reset (also prevents unauthorized programming or operation)
- Gas purge button
- 4-pin receptacle for connecting remote controls
- Diagnostic routine for troubleshooting system
- Digital signal for external arc length controls (automatic voltage controls) to lock onto background or peak pulse current levels
- Cold wire feed start and stop with time delay
- One time-delayed normally open/ normally closed (NO/NC) relay contact for cold wire feeder

PROGRAMMING FEATURES

- Presettable programming
- Provides pulsing and non-pulsing modes
- Two formats available for programming pulsing parameters
- Pulse frequency range of 0.1 to 10 Hz (pulses-per-second)
- Independent programming of initial slope and final slope with a range of 0 to 25 seconds in increments of 0.1 seconds
- "Dry Run" program — allows operator to run through entire program without initiating the arc
- Program link capability — allows individual programs to be connected and run in any order
- Program combine capability — allows a program to be created using individual parameters from individual programs (for example, several different weld/peak amperage settings can be written into a single program)

Note: For detailed descriptions and explanation of timing functions and mode descriptions, please refer to Intellitig Literature, Index No. AY/9.0.

SP4 ELECTROSLOPE, PULSER, AND SEQUENCER



SP4 ELECTROSLOPE®, PULSER, AND SEQUENCER
(#041 612 Field) D :95
For Syncrowave 500
Provides weld programming by means of solid-state timers.

Initial current: time interval from start weld current to beginning of upslope.

Upslope and weld: begins at end of initial current. Times upslope and weld current.

Downslope and final current: starts at end of weld current. Times downslope and final current.

Pulsed current provides controlled penetration, reduced warping, and better control of the weld puddle.

Installation of preflow option is recommended when spot welding.

Dimensions: H 8-3/4 in. (222 mm), W 31-1/4 in. (794 mm), D 23-1/4 in. (591 mm)

Weight: 90 lbs. (41 kg)

Tool storage area: H 8-3/4 in. (222 mm), W 31-1/4 in. (794 mm), D 14 in. (356 mm)

Power: operates from Syncrowave control voltages

DIGITAL TIMERS
The timers used in the SP4 programmer can be easily changed to display in seconds, minutes, or hours (0.01 to 99.9).

FEATURES
- Noise (high-frequency) immunity
- Dust tight
- Rugged and reliable
- Presettable digital display

OPTIONS AND ACCESSORIES

Skill Level Index
The box to the right of the stock number of field-installed options contains a letter and number. The letter indicates the skill level required to install the option. The number indicates the approximate time required for installation (see legend).

A– Easy. No previous experience needed.
B– Average. Requires removal of service panels. Mechanical ability is helpful.
C– Difficult. May require the use of an ohmmeter and/or splicing of electrical wires. Repair or replacement of component parts is more difficult.
D– Technical. May require the use of an ohmmeter and the ability to read a circuit diagram. Repair or replacement of component parts is complex.

Example:
B :30 Skill Level: B, Time: 30 minutes

FOR SYNCROWAVE®250

NO. 22 RUNNING GEAR
(#042 258)
Includes two 10 in. (254 mm) wheels and two 5 in. (127 mm) casters and a two-compartment rack for gas cylinder(s) or Watermate™ coolant system.

VOLTMETER AND AMMETER
(#042 140 Field) B :30
Indicates AC and DC output. Meters mount in front panel.

PREFLOW TIMER
(#042 144 Field) B :30
Provides 0 to 15 seconds of gas preflow time. On/Off switch included.

SPOT WELD TIMER
(#042 142 Field) B :30
Adjustable 0 to 5.7 second time control for TIG spot welding. On/Off switch included.

POWER FACTOR CORRECTION
(#042 353 Field) B :30

PC-300 PULSED GTAW CONTROL
(#042 297)
Can be used with power sources that have built-in high frequency, or it can be used with a power source and an external high-frequency unit. Includes 8 ft.(2.4 m) interconnecting cord and 115 VAC power cord. Front panel controls include:
- Peak Amperage Adjustment
- Background Amperage Adjustment
- Pulses-Per-Second Adjustment (0.5 to 20 pulses-per-second scale or 10 to 300 pulses-per-second scale) ***Note: High scale not recommended when using Syncrowave power source.***
- Percent On Time Control
- Amperage Remote/Panel Control
- Output Contactor On/Off Switch
- Pulser On/Off Switch
- Power On/Off Switch
- Remote Control Receptacle (for remote hand or foot controls)

OPTIONS AND ACCESSORIES (Cont.)

FOR SYNCROWAVE® 351

NO. 17A RUNNING GEAR
(#042 694)
Three 8 in. (203 mm) rubber-tired wheels with towing handle and rack for two cylinders.

(OPT. #1) PREFLOW/SPOT TIMER
(#042 641 Factory)
(#042 642 Field) A :15
Provides 0 to 15 seconds of gas preflow and 0 to 15 seconds of spot time. Each has separate On/Off switch.

(OPT. #2) START CONTROL/ CRATER FILL
(#042 643 Factory)
(#042 644 Field) A :15
Provides a starting current level higher or lower than welding current for a period of 0 to 15 seconds. Provides crater fill time of 0 to 15 seconds. Each has separate On/Off switch.

(OPT. #3) PULSER
(#042 645 Factory)
(#042 646 Field) A :15
For welding thin materials. Provides heating and cooling effect of the weld puddle. Provides 0.25 to 10 pulses-per-second.

POWER FACTOR CORRECTION
(#042 671 Factory)
(#042 672 Field) B :90

FOR SYNCROWAVE® 500

NO. 17 RUNNING GEAR
(#004 563)
Three 8 in. (203 mm) rubber-tired wheels with towing handle and rack for two cylinders. Also for use with Syncrowave 350 and 300 models.

PREFLOW TIMER
(#041 173 Field) C :90
Provides 0 to 15 seconds of gas preflow time. On/Off switch included.

PULSER
(#003 266 Field) C :90
For welding of thin materials. Provides heating and cooling effect of the weld puddle. Provides 0.25 to 10 pulses-per-second.

SPOT WELD TIMER
(#041 171 Field) C :90
Adjustable 0 to 5 second time control for TIG spot welding. On/Off switch included.

OPTIONS AND ACCESSORIES (Cont.)

FOR ALL SYNCROWAVE® MODELS

REMOTE CONTROLS AND SWITCHES

RFC-14 FOOT CONTROL (#129 339)
Heavy duty foot current and contactor control. Includes 20 ft. (6 m) cord and 14-pin plug.

RCC-14 REMOTE CONTACTOR AND CURRENT CONTROL (#151 086)
Rotary motion fingertip control. Fastens to TIG torch using two Velcro strips. Includes 28 ft. (8.5 m) cord and plug.

RHC-14 HAND CONTROL (#129 340)
Miniature hand control for remote current and contactor control. Dimensions: 4 in. (102 mm) x 4 in. (102 mm) x 3-1/4 in. (82 mm). Includes 20 ft. (6 m) cord and 14-pin plug.

RMLS-14 CONTACTOR SWITCH (#129 337)
Push forward for maintained contact and back for momentary contact. Includes 20 ft. (6 m) cord and 14-pin plug.

ADAPTER CORD (#041 947)
1 ft. (305 mm) cord with 14-pin plug to 5-socket receptacle for use with 5-pin remote controls.

EXTENSION CORDS For 14-Pin Remote Controls

(#122 972)	10 ft. (3 m)
(#122 973)	25 ft. (7.6 m)
(#122 974)	50 ft. (15.2 m)
(#122 975)	75 ft. (22.9 m)

GAS TUNGSTEN ARC (TIG) WELDING BOOK (#170 555)
A comprehensive text on all aspects of the GTAW process. Filled with figures and tables to illustrate process technique and equipment setup. Glossary of TIG terms also provided. 86 pages – 8-1/2 x 11 in.

To order, call Miller Literature Distribution Center at 1 (414) 751-2120, or FAX 1 (414) 751-2121.

VIDEO–GTAW SETUP PROCEDURES
(#108 241) 13:00 minutes
A detailed demonstration on preparing your equipment for TIG welding. Uses a Syncrowave 250 power source, but topics fit any TIG setup including air- or water-cooled systems. In-depth discussion of tungstens and gases.

WATER COOLANT SYSTEMS

For detailed information on Coolant Systems, refer to Literature Index No. AY/7.2.

RADIATOR 1A (#042 492)
1/4 HP, 115 VAC, 50/60 Hz motor. 1.5 gal. (5.7 L) capacity.

RADIATOR 2A (#042 493)
1/4 HP, 230 VAC, 50/60 Hz motor. 1.5 gal. (5.7 L) capacity.

WATERMATE™ 1A (#042 495)
1/4 HP, 115 VAC, 50/60 Hz motor. 1.5 gal. (5.7 L) capacity.

COOLMATE™ 4 (#042 288)
1/4 HP, 115 VAC, 50/60 Hz motor. 4 gal. (15 L) capacity.

MILLER COOLANT (For freezing protection) (#128 705)
1 gal. (3.8 L). Contains 35% pure ethylene glycol and 65% deionized water.