



OM-276533H

2018-08

Processes



Stick (SMAW) Welding



MIG (GMAW) Welding
Flux Cored (FCAW) Welding



TIG (GTAW) Welding

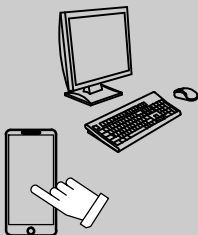
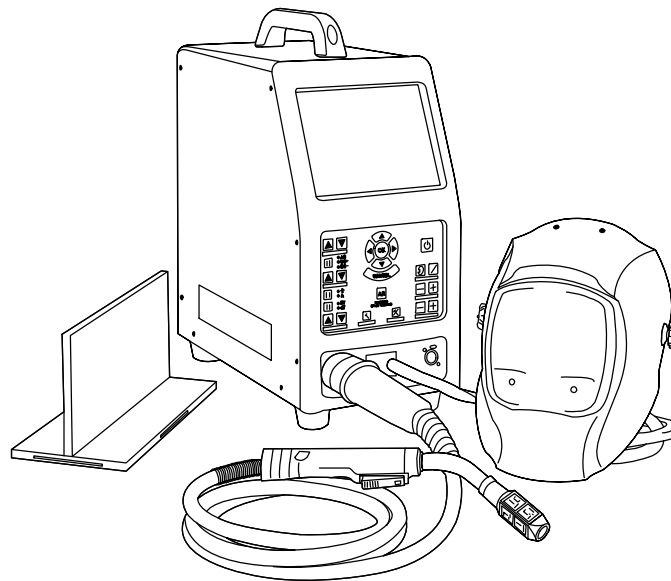
Description



Arc Welding Training System

AugmentedArcTM

Welding Training System



For product information,
Owner's Manual translations,
and more, visit

www.MillerWelds.com

OWNER'S MANUAL

File: Accessory



From Miller to You

Thank you and congratulations on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite.



ISO 9001
Quality

Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001 Quality System Standard.

We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide the exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.



Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual specification sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.**



Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.



TABLE OF CONTENTS

SECTION 1 – SAFETY PRECAUTIONS – READ BEFORE USING	1
1-1. Symbol Usage	1
1-2. Welding Training System Hazards	1
1-3. Proposition 65 Warnings	1
1-4. Principal Safety Standards	1
SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION	2
2-1. Symboles utilisés	2
2-2. Dangers liés au système de formation en soudure	2
2-3. Proposition californienne 65 Avertissements	2
2-4. Principales normes de sécurité	2
SECTION 3 – DEFINITIONS	3
3-1. Miscellaneous Symbols And Definitions	3
SECTION 4 – SPECIFICATIONS	4
4-1. Introduction	4
4-2. System Features And Benefits	4
4-3. AugmentedArc Complete Package	4
4-4. Serial Number And Rating Label Location	4
4-5. Unit Specifications	5
4-6. Environmental Specifications	5
SECTION 5 – INSTALLATION	6
5-1. Selecting A Location	6
5-2. Simulator Components	7
5-3. Installing The Training System – Stand-Alone Configuration	8
5-4. Installing The Training System – Classroom Configuration	9
5-5. Assembling AR TIG Torch	10
5-6. Assembling AR Stick Electrode	11
5-7. AR Stick Electrode, MIG Gun, TIG Torch, And Workpieces	12
5-8. AR Welding Helmet	13
5-9. Making Helmet Adjustments	13
5-10. Connecting Weld Cables	14
SECTION 6 – SYSTEM CONTROLS AND COMPONENTS	15
6-1. Simulator Controls	15
SECTION 7 – OPERATION	16
7-1. Equipment Setup	16
7-2. Getting Started	16
A. Login Screens	16
B. Course Selection	17
C. Lighting Calibration	18
D. Correcting Improper Weld Setting	20
E. Determining Correct Position Of MIG Gun/Electrode And AR Helmet	22
F. Course Analysis	23
SECTION 8 – SYSTEM SETTINGS	25
8-1. Accessing Administrator Home Screen	25
8-2. Changing System Configuration	25
A. Changing System Language Setting	25
B. Changing System Units And Standards	25
C. Changing System Date And Time	26
D. Changing System Mode	26
E. Changing Tracking Method	26
F. Changing Lighting Calibration Options	26
G. Restoring Factory Configuration	26
8-3. Software Updates	27
A. Software Updates – Stand-Alone Mode	27
B. Software Updates – Classroom Mode	27

TABLE OF CONTENTS

8-4. Troubleshooting	28
8-5. Check Components	29
A. Checking Front Panel Functions	29
B. Checking Audio	29
C. Checking Displays	29
D. Checking Camera Set	29
E. Calibrating Electrode Retraction	30
8-6. Cameras	31
A. Configure Camera Set	31
B. Restore Factory Camera Calibration	36
8-7. Video Device Settings	37
A. Lighting Calibration	37
B. Temperature Setting (Figure 8-23)	37
C. Intensity Setting (Figure 8-24)	38
D. Custom Settings	38
SECTION 9 – USING THE TEACHER SOFTWARE	40
9-1. Installing The Teacher Software Program	40
9-2. Using The Teacher Software	43
A. Student Home Page (Figure 9-10)	44
B. Adding A Student (Figure 9-11)	44
C. Editing Student Information	44
D. Deleting A Student (Figure 9-12)	45
9-3. Module Management	45
A. Task Information	46
B. Adding A Task (Figure 9-15 And Figure 9-16)	46
C. Edit And Delete A Task	48
D. Designing The Welding Exercise (Figure 9-18)	48
E. Scoring	49
9-4. Course Management	50
A. Adding Courses	50
B. Editing A Course	51
C. Deleting A Course	52
D. Course History	52
9-5. Reviewing Student Activity And Results	53
A. Student Information (Figure 9-27)	53
B. Virtual Classroom	54
C. Creating Reports	54
9-6. Resetting AugmentedArc Content (Figure 9-30)	55
9-7. Changing Teacher Software Password	55
SECTION 10 – MAINTENANCE	56
10-1. Routine Maintenance	56
SECTION 11 – TROUBLESHOOTING	56
11-1. Troubleshooting Table	56
SECTION 12 – RECONFIGURING STANDALONE ROUTER FOR CLASSROOM MODE	57
SECTION 13 – PARTS LIST	58
SECTION 14 – SOFTWARE LICENSE AGREEMENT	60
WARRANTY	

SECTION 1 – SAFETY PRECAUTIONS – READ BEFORE USING

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 **Protect yourself and others from injury — read, follow, and save these important safety precautions and operating instructions.**

1-1. Symbol Usage



DANGER! – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

NOTICE – Indicates statements not related to personal injury.

 Indicates special instructions.



This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Welding Training System Hazards



The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-4. Read and follow all Safety Standards.



Only qualified persons should install, operate, maintain, and repair this equipment. A qualified person is defined as one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated ability to solve or resolve problems relating to the subject matter, the work, or the project and has received safety training to recognize and avoid the hazards involved.

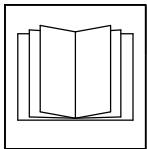
- Do not use the training system until you are sure it is correctly assembled and working properly.
- Before each use, inspect the training system for damage and verify it is secure and installed properly.
- Use the training system only as specified in the manual.



ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns.

- Do not touch live electrical parts.
- Disconnect input power before installing or servicing this equipment.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring – replace immediately if damaged – bare wiring can kill.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to the manual.
- Keep all panels and covers securely in place.
- Do not use the training system during an electrical storm. Turn off equipment and disconnect input power until risk of lightning has passed.
- Always verify the supply ground – check and be sure that cord plug is connected to a properly grounded receptacle outlet.
- Do not use equipment in damp or wet conditions.



READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform installation, maintenance, and service according to the Owner's Manuals, industry standards, and national, state, and local codes.
- Do not repair, modify, or disassemble the training system or use with parts or accessories not supplied by the manufacturer. Use only approved components and accessories from the manufacturer.
- Be sure all hardware is properly tightened.

1-3. Proposition 65 Warnings



WARNING: Cancer and Reproductive Harm – www.P65Warnings.ca.gov

1-4. Principal Safety Standards

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use — Part 1: General requirements, CAN/CSA Standard C22.2 No. 61010-1-12, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N5 (phone: 800-463-6727, website: www.csagroup.org).

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

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⚠ Pour écarter les risques de blessure pour vous-même et pour autrui — lire, appliquer et ranger en lieu sûr ces consignes relatives aux précautions de sécurité et au mode opératoire.

2-1. Symboles utilisés



DANGER! – Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.



Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

AVIS – Indique des déclarations pas en relation avec des blessures personnelles.

 Indique des instructions spécifiques.



Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ELECTRIQUE, PIECES EN MOUVEMENT, et PIECES CHAUDES. Consulter les symboles et les instructions ci-dessous y afférant pour les actions nécessaires afin d'éviter le danger.

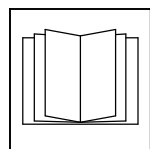
2-2. Dangers liés au système de formation en soudure



Les symboles représentés ci-dessous sont utilisés dans ce manuel pour attirer l'attention et identifier les dangers possibles. En présence de l'un de ces symboles, prendre garde et suivre les instructions afférentes pour éviter tout risque. Les instructions en matière de sécurité indiquées ci-dessous ne constituent qu'un sommaire des instructions de sécurité plus complètes fournies dans les normes de sécurité énumérées dans la Section 2-4. Lire et observer toutes les normes de sécurité.



L'installation, l'utilisation, l'entretien et les réparations ne doivent être confiés qu'à des personnes qualifiées. Une personne qualifiée est définie comme celle qui, par la possession d'un diplôme reconnu, d'un certificat ou d'un statut professionnel, ou qui, par une connaissance, une formation et une expérience approfondies, a démontré avec succès sa capacité à résoudre les problèmes liés à la tâche, le travail ou le projet et a reçu une formation en sécurité afin de reconnaître et d'éviter les risques inhérents.



LIRE LES INSTRUCTIONS.

- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l'installation, l'entretien et toute intervention selon les manuels d'utilisateurs, les normes nationales, provinciales et de l'industrie, ainsi que les codes municipaux.
- Ne pas réparer, modifier ou démonter le système de formation, et ne pas l'utiliser avec des pièces ou accessoires non fournis par le fabricant. Utiliser uniquement des composants et accessoires approuvés par le fabricant.
- S'assurer que toute la quincaillerie est bien serrée.
- Ne pas utiliser le système de formation avant d'être certain qu'il est bien monté et qu'il fonctionne correctement.

- Avant chaque utilisation, inspecter le système de formation pour déceler tout signe de dommage et s'assurer qu'il est bien installé et maintenu correctement.
- Utiliser le système de formation seulement conformément au manuel.



UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

Tout contact avec des pièces électriques sous tension peut causer un choc mortel ou des brûlures graves.

- Ne pas toucher aux pièces électriques sous tension.
- Couper le courant avant d'installer ou de faire l'entretien de cet équipement.
- En effectuant les raccordements d'entrée, fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Les câbles doivent être exempts d'humidité, d'huile et de graisse; protégez-les contre les étincelles et les pièces métalliques chaudes.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretien l'appareil conformément à ce manuel.
- Maintenir solidement en place tous les panneaux latéraux et les capots.
- Ne pas utiliser le système de formation pendant un orage électrique. Mettre l'équipement hors tension et débrancher l'alimentation électrique jusqu'à ce que soit éliminé le risque d'éclairs.
- Toujours vérifier la terre du cordon d'alimentation – Vérifier et s'assurer que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- Ne pas utiliser l'équipement en conditions humides ou mouillées.

2-3. Proposition californienne 65 Avertissements













AVERTISSEMENT : cancer et troubles de la reproduction – www.P65Warnings.ca.gov




2-4. Principales normes de sécurité








Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use — Part 1: General requirements, CAN/CSA Standard C22.2 No. 61010-1-12, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csagroup.org).

SECTION 3 – DEFINITIONS

3-1. Miscellaneous Symbols And Definitions

	Power On/Off
	Electrode Light (Stick) Filler Rod Light (TIG)
	Helmet Light
	Decrease
	Increase
	Settings
	Clean Slag
	Pass
	Fail
	Down

	Up
	Change Transfer Mode
	Wire Feed
AR	Augmented Reality
A	Amperage
V	Voltage
2T	Press To Start Weld; Release To Stop Weld
4T	Press And Release To Start Weld; Press And Release To Stop Weld
DC+	DC Electrode Positive
DC-	DC Electrode Negative

AC	Alternating Current
IP	Internal Protection Rating
	Input Plug And Cord
	Connected To Network
	Disconnected From Network
	Connected And Seeing Theory
	Connected And Analyzing An Exercise
	Connected And Doing A Quiz
	Connected And Performing An Exercise

SECTION 4 – SPECIFICATIONS

4-1. Introduction

The AugmentedArc is an augmented reality (AR) welding training system that provides the new student or the experienced welder the opportunity to develop, enhance, or verify their welding abilities through an interactive, simulated welding process on a variety of weld joint configurations. This product is designed to help welding students acquire the necessary welding knowledge, capacities, abilities, welding sensations and skills, thereby saving the time and money normally spent training in a live welding situation. It is an educational solution to help both students and trainers improve their learning experience and enhance results and qualifications. The system can be installed as a standalone or classroom configuration.

After the AugmentedArc system is installed, the user turns on the training system, selects the desired welding assignment, puts on the augmented reality (AR) welding helmet and welding gloves (welding gloves are recommended to simulate a live welding experience), and begins the simulated welding activity. The cameras and AR markers convey the weld data (gun angles, gun speed, contact tip to work distance [CTWD], aim) to the system microprocessor, which compares it to the specified weld parameters of the assignment selected. The system evaluates the weld data and grades the student's performance.

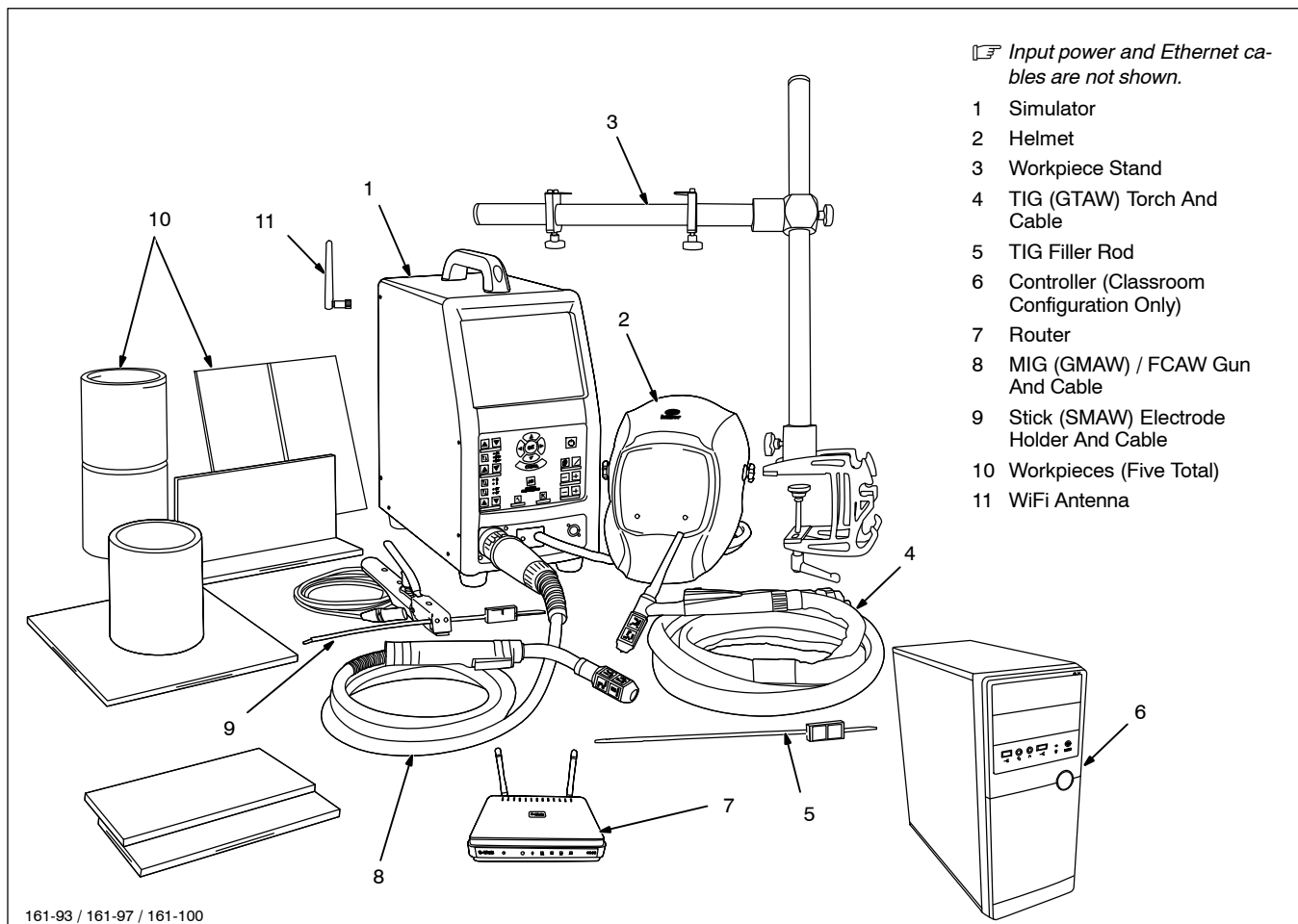
The AugmentedArc instruction is complementary to training with live welding equipment. To complete their welding training, students should also practice their acquired skills by welding under the supervision of qualified persons in a safe welding environment.

NOTICE – Do not install or use the Augmented Arc in the same area as live welding equipment.

4-2. System Features And Benefits

- Advanced computer simulation techniques using artificial vision technology create a real welding environment.
- Teacher software allows the instructor to adapt their training programs to the AugmentedArc system. The instructor can manage and monitor student activity and progress from a PC (personal computer) (see Section 9).
- Analysis mode allows all of the welding exercises performed in the simulator to be visualized, providing detailed results of all of the welding parameters.
- System allows for remote maintenance and software updates, and is adaptable to meet specific training requirements.
- The system configuration can be installed as a stand-alone or classroom application. The stand-alone application includes a simulator and a router, and all of the information is saved on the unit. The classroom application can include multiple simulators, a router, and a controller. All of the information is saved on the controller.

4-3. AugmentedArc Complete Package



4-4. Serial Number And Rating Label Location

The serial number and rating information for this product is located on the back of the unit. Use rating label to determine input power requirements, and to register for free software upgrades. For future reference, write serial number in space provided on back cover of this manual.

4-5. Unit Specifications

Dimensions (L x W x H)	Simulator: 17.25 x 9.38 x 21 in. (438 x 238 x 533 mm)
Weight	Simulator: 26.3 lb (12 kg) AR Welding Helmet: 2.5 lb (1.1 kg)
Input Power	100 to 240 Volts AC, 4.5 to 9.0 Amps, 50/60 Hz
External VGA Port Resolution	1024 x 768 Pixels
Simulation Modes/Processes	Stick (SMAW), MIG (GMAW/FCAW), TIG (GTAW)
Software Version	Displayed On System Settings Screen.  Register for free software upgrades at MillerWelds.com/register .
Computer	OS: Linux Processor: i7 RAM: 4GB DDR4 Graphics Card: NVIDIA Maxwell GPU GeForce GTX 950 60GB Solid State Hard Drive
Main Monitor	9.7 in. integrated LCD monitor, 1024 x 768 resolution
PC Requirements For Installation Of Teacher Software (See Section 9)	Operating System: Windows Vista, Windows 7, Windows 8, Windows 10 Processor: 32 Bits (x86) 2.2 GHz 3 MB RAM: 2 GB Graphic Board: 512 MB DirectX 9.0c Compatible; NVIDIA GeForce GT440 or Superior; ATI Radeon HD5000 Or Higher Hard Disc: 1 GB
Supported Welding Processes	Stick (SMAW), MIG (GMAW), FCAW, TIG (GTAW)
Parameters Tracked By Cameras	MIG: Work Angle, Travel Angle, Travel Speed, Contact Tip To Work Distance (CTWD), Aim Stick: Work Angle, Travel Angle, Travel Speed, Arc Length, Aim TIG: Rod Work Angle, Rod Filler Angle, Travel Angle, Travel Speed, Arc Length, Aim, Work Angle
Supported Joints	Bead On Plate, T-Joint, Butt Joint, Lap Joint, Pipe-Plate, Pipe-Pipe
Welding Positions	1F, 2F, 3F, 4F, 1G, 2G, 3G, 4G, 5G, 6G
Workpiece Positions	Horizontal, Vertical, Flat, Overhead
Voltage Selection	MIG (GMAW) 10 – 36 Volts; FCAW: 12 – 36 Volts
Amperage (Intensity) Selection	Stick (SMAW): 50 – 240 Amps; MIG (GMAW), FCAW, TIG (GTAW): 25 – 270 Amps
Polarity Selection	DCEP, DCEN, AC
Shielding Gas Selection	CO ₂ , Argon-O ₂ , Argon-CO ₂ , And Mixtures
Wire Speed Selection	MIG (GMAW) And FCAW: 47 – 787 ipm (1.2 – 20 m/min)
Base Material Selection	Carbon Steel, Stainless Steel, Aluminum
Workpiece Thickness Selection	1/8, 1/4, 3/8 in. (3.2, 6.4, 9.5 mm)
Stick Electrode Selection	E7018, E6010, E6013
Stick Electrode Diameter Selection	1/8, 3/32, 5/32 in. (2.50, 3.25, 4.00 mm)
Wire Diameter Selection	Solid Wire: 0.030, 0.035, 0.045 in. (0.8, 1.0, 1.2 mm)
Filler Rod Selection	5/64, 3/32 in. (2.0 And 2.4 mm)
Real Time Guide Parameters	On-Screen Help Guides Provide Corrective Feedback To User During Simulation
Teacher Software	Stand-Alone Application
Helmet	Miller Black Infinity Helmet With Premium Headgear. Includes integrated 5.6 in. LCD display (1280 x 800), integrated speakers.
MIG Guns/TIG Torches	Miller Brand
Stick Electrode And TIG Filler Rod Markers	AR Marker Attachment
Measurements	Global Setting Displays Measurements In Standard (Imperial) Or Metric
Languages	English, French, Spanish

4-6. Environmental Specifications

A. Temperature Specifications

Operating Temperature Range	Storage/Transportation Temperature Range
41 to 113°F (5 to 45°C)	–4 to 140°F (–20 to 60°C)

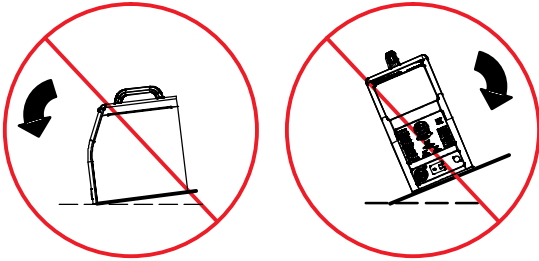
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SECTION 5 – INSTALLATION

5-1. Selecting A Location



⚠ Do not move or operate unit where it could tip.



⚠ Only qualified persons should install, operate, maintain, and repair this unit.

⚠ Installation must meet all National, State, and Local Codes – have only qualified persons make this installation.

⚠ Do not move unit by pulling on simulator, router, helmet, or cables or equipment may tip.

⚠ Do not use this equipment to support personnel, large tools, or other material.

NOTICE – Use training system only indoors and away from sources of high frequency (TIG welders) and other types of electrical interference. It may be necessary to enclose nearby electrical wiring in conduit if unit is affected by interference.

NOTICE – Do not use training system in damp or wet locations. Keep training system components dry.

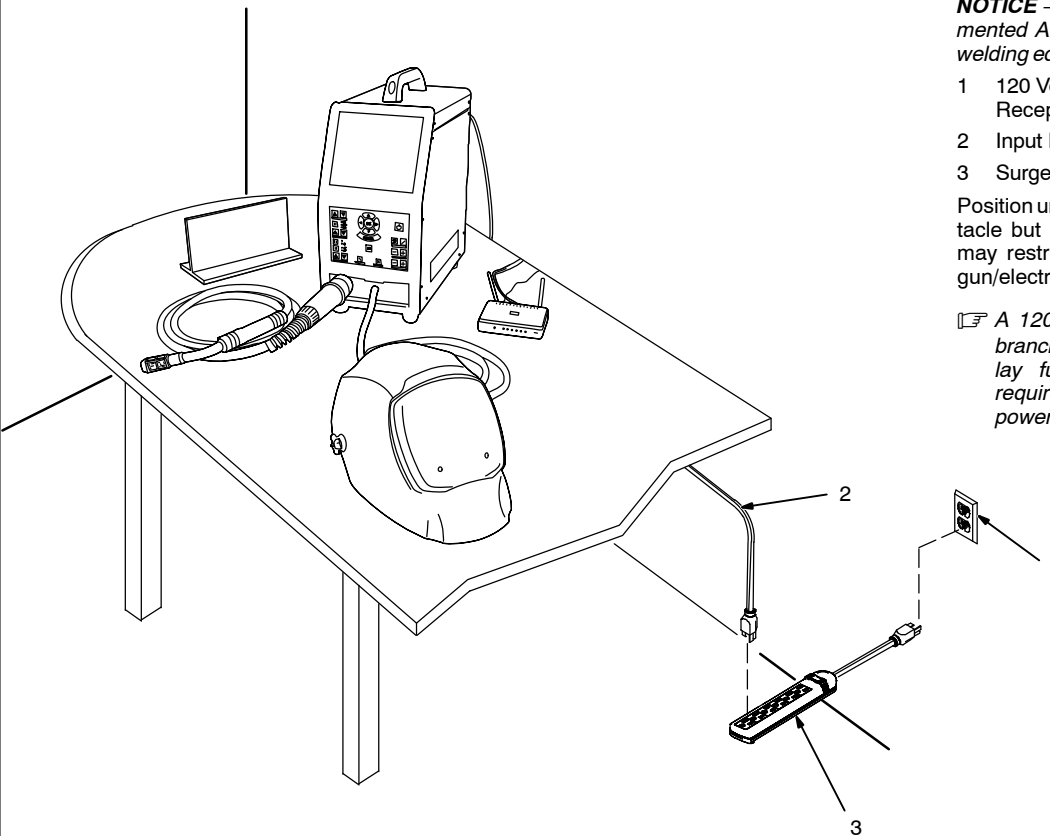
NOTICE – Do not position training system where the cameras are in direct sunlight. High intensity sunlight can interfere with gun tracking.

NOTICE – Do not install or use the Augmented Arc in the same area as live welding equipment.

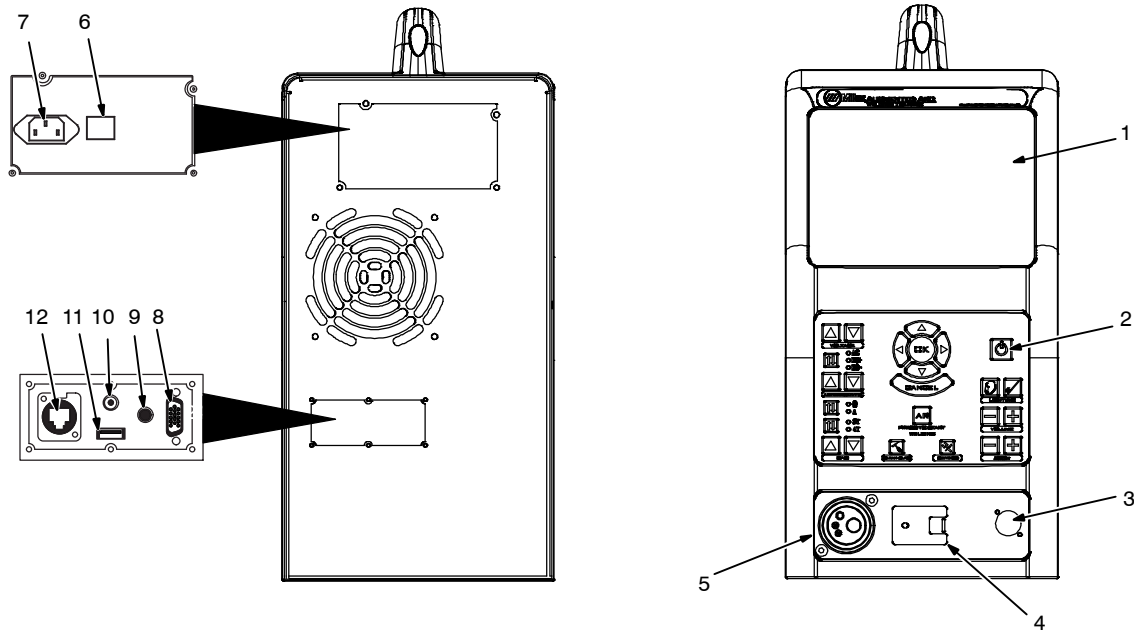
- 1 120 Volt, 15 Amp AC Grounded Receptacle
- 2 Input Power Cord(s)
- 3 Surge-Protected Power Strip

Position unit near the 120 volt AC receptacle but away from obstructions that may restrict movement of cables and gun/electrode holders.

ⓘ A 120 volt AC, 15 amp individual branch circuit protected by time delay fuses or circuit breaker is required. Use of a surge-protected power strip is recommended.




5-2. Simulator Components



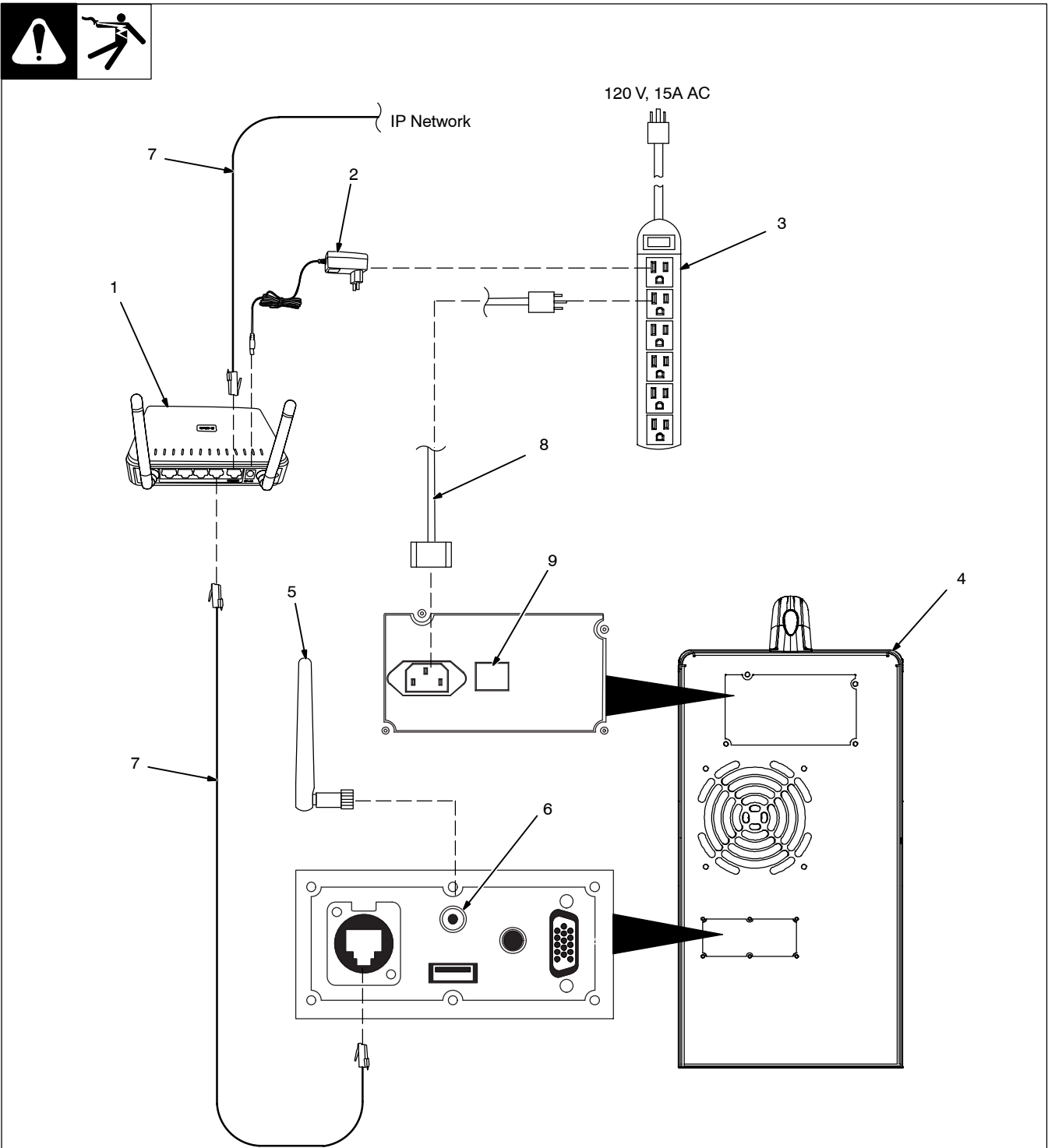
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- | | | |
|---|--------------------------------|---------------------------------|
| 1 Display Screen | 6 Simulator Input Power Switch | 9 Audio Output Connector |
| 2 Control Panel (See Section 6-1) | 7 120 Volt AC Input Receptacle | 10 WiFi Receptacle |
| 3 Stick Cable And TIG Filler Rod Receptacle | 8 External VGA Port | 11 USB Receptacle |
| 4 AR Helmet Cable | | 12 Internet/Ethernet Receptacle |
| 5 MIG/FCAW And TIG Cable Receptacle | | |

 *Powered adapter (not included) can be used to connect to an HDMI monitor.*

Notes

5-3. Installing The Training System – Stand-Alone Configuration



276 687 / 161-94

1 Stand-Alone Router

2 Router Power Cable

3 120 Volt 15 Amp AC Receptacle Or Power Strip

Use of a surge-protected power strip is recommended.

For best results, locate router within 39 in. (1 m) of simulator.

4 Simulator

5 WiFi Antenna

6 WiFi Receptacle

Connect WiFi antenna to WiFi receptacle on simulator.

7 Network (Ethernet) Cables (Optional)

Connect IP network cable to Internet receptacle on back of router. Connect additional network cable from router receptacle LAN1 to Ethernet receptacle on back of simulator.

8 Simulator Power Cable

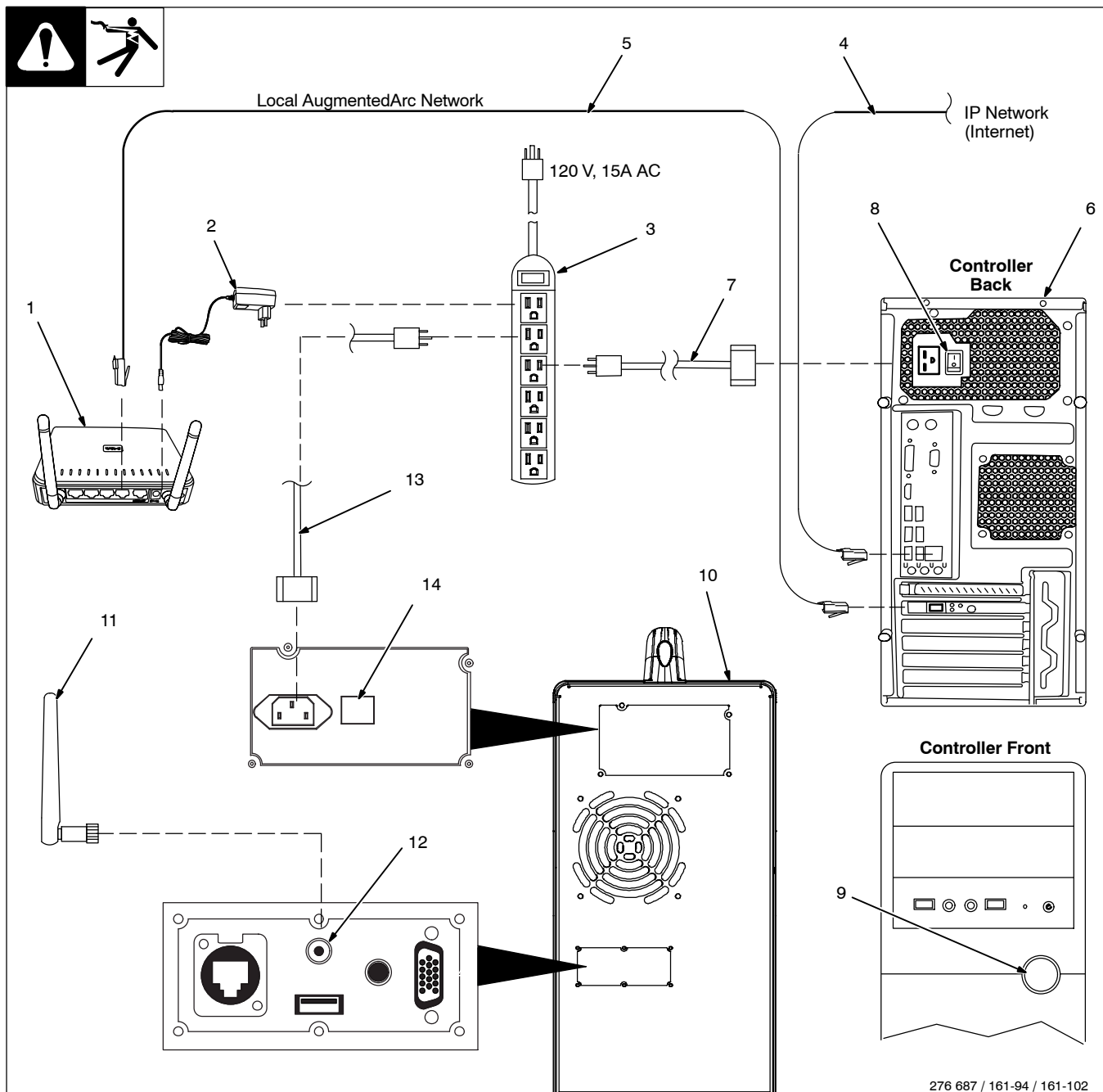
Connect one end of simulator power cable to simulator. Connect other end of power cord to 120 volt AC receptacle.

9 Input Power Switch

Place Power switch in On position.

Information on using the Teacher Software program is provided in Section 9).

5-4. Installing The Training System – Classroom Configuration



276 687 / 161-94 / 161-102

1 Classroom Router

It is very important that only the Classroom Router is used and that all Stand-alone Routers are not powered on.

2 Router Power Cable

3 120 Volt 15 Amp AC Receptacle Or Power Strip

Use of a surge-protected power strip is recommended.

For best results, locate router within 39 in. (1 m) of simulator.

Connect one end of router power cable to receptacle on back of router. Connect other end of cable to 120 volt AC receptacle.

Wait about 90 seconds until the WiFi signal icon on the router is illuminated.

4 IP Network (Ethernet) Cable

5 Local AugmentedArc Network (Ethernet) Cable

6 Controller

The controller must have the same version of the software as the simulator (see Section 8-3).

Connect one end of network cable to receptacle LAN1 on back of router. Connect other end of cable to Network receptacle on controller. Connect IP network cable to internet receptacle on back of controller.

7 Controller Power Cable

Connect one end of controller power cable to 120 AC receptacle on back of controller. Connect other end of cable to 120 volt AC power supply.

8 Controller Input Power Switch

Place Power switch in On position.

9 Controller Power On/Off Switch

Press and release the On/Off switch and wait 90 seconds for it to boot up completely.

10 Simulator

11 WiFi Antenna

12 WiFi Receptacle

Connect WiFi antenna to WiFi receptacle on simulator.

13 Simulator Power Cable

Connect one end of power cable to simulator. Connect other end of power cord to 120 volt AC receptacle.

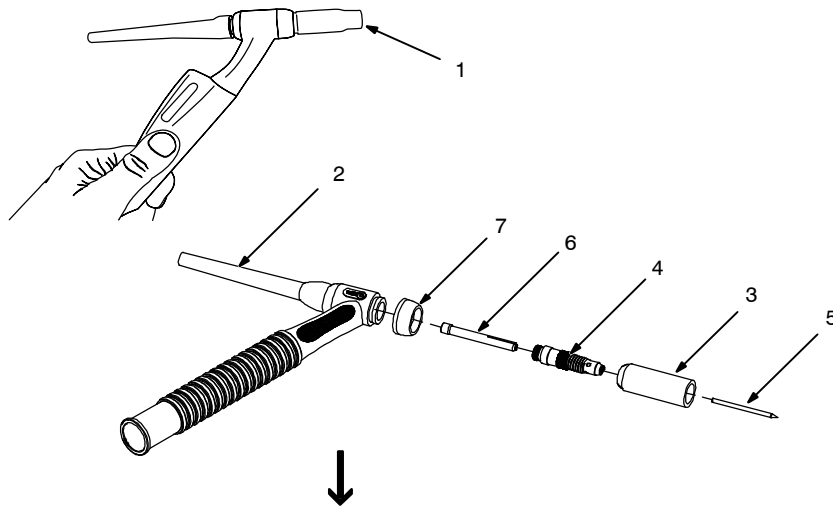
14 Simulator Input Power Switch

Place Input Power switch in On position. Press the On/Off button on the front panel and allow 90 seconds for it to boot up completely. Change system mode to Classroom (see Section 8-2D).

To use the teacher software in either the classroom or stand-alone configuration, connect a laptop or PC to the network provided by the router.


Information on using the Teacher Software program is provided in Section 9.

5-5. Assembling AR TIG Torch



- 1 AR TIG Torch
- 2 Backcap
- 3 Cup
- 4 Collet Body
- 5 Tungsten Electrode
- 6 Collet
- 7 Heat Shield

Remove backcap (counterclockwise).

 The original backcap is not used in the AR TIG torch assembly and can be discarded.

Unscrew cup and collet body (counterclockwise).

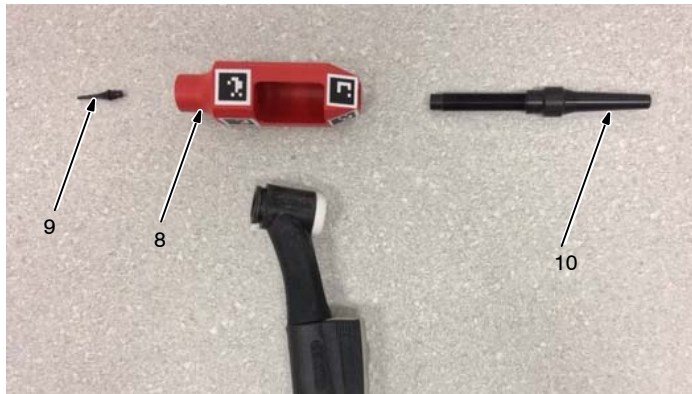
Remove tungsten electrode and collet.

Remove heat shield.

- 8 TIG Torch AR Nozzle
- 9 TIG Torch AR Tip
- 10 TIG Torch AR Backcap

Locate TIG torch AR nozzle, tip, and backcap supplied with system.

Insert the head of the torch into the opening of the AR nozzle. Insert the AR backcap through the opening in the rear of the AR nozzle and screw into the TIG torch head (clockwise). Screw the TIG torch AR tip into the TIG torch AR nozzle (clockwise).



5-6. Assembling AR Stick Electrode



- 1 Marker Tip
- 2 Marker Block

Screw the marker tip into the marker block.

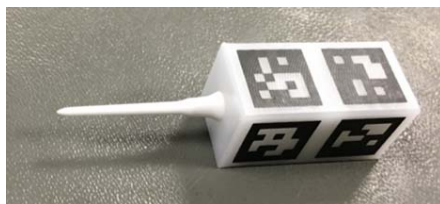
- 3 Marker Assembly
- 4 Electrode

Press fit the marker assembly over the tip of the electrode.

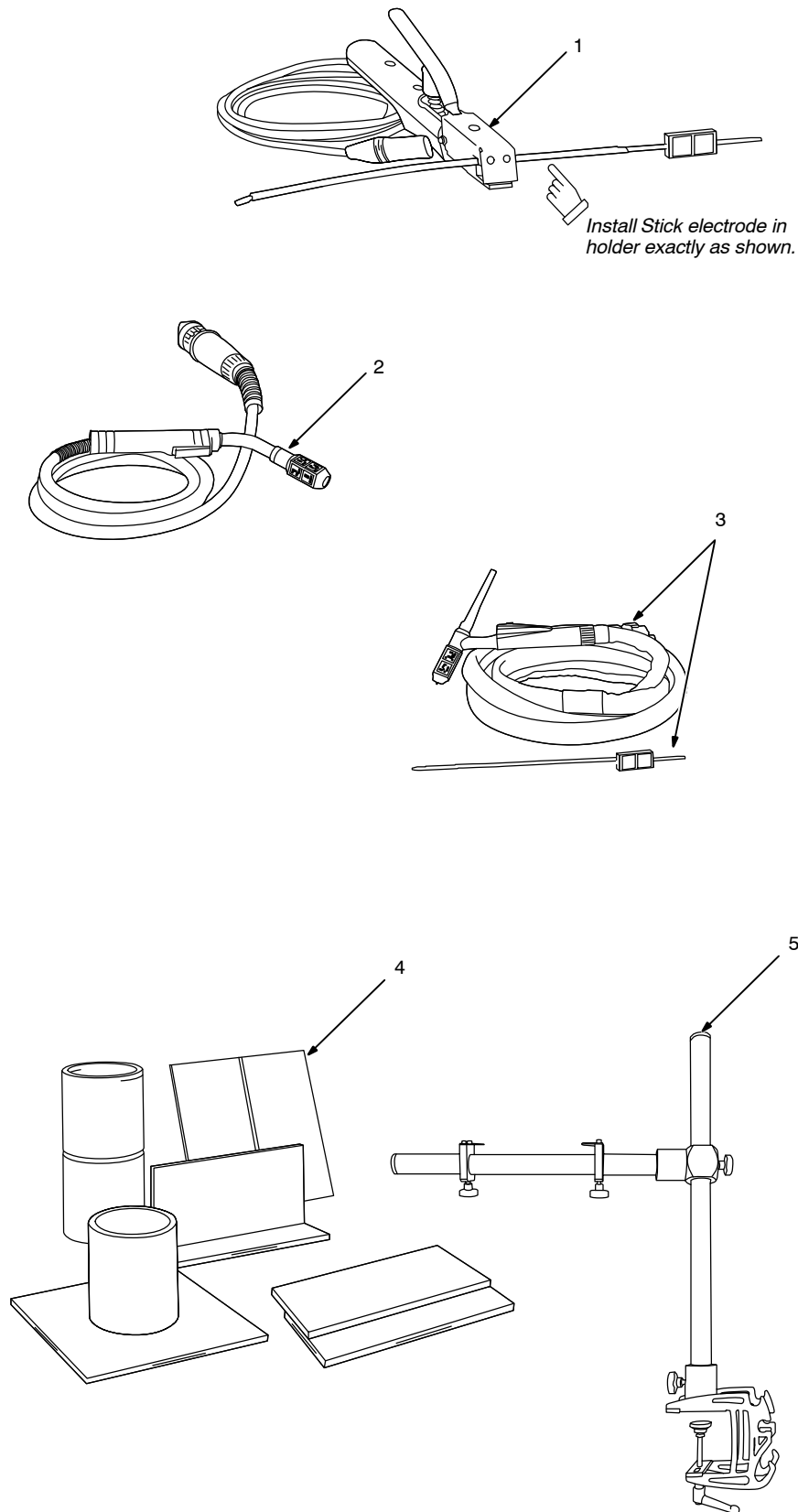
This assembly will also be used as the TIG filler rod.

- 5 Electrode Holder

Place the stick electrode in the electrode holder as shown. With the handle facing up, the electrode should face left.



5-7. AR Stick Electrode, MIG Gun, TIG Torch, And Workpieces



1 AR Stick Electrode And Holder

Markers on the stick electrode allow it to work with the AR system. The electrode is similar in shape, weight, and size to a real electrode. It is placed within the holder, which is connected to the simulator. The holder retracts the electrode during welding to simulate the electrode consumption in real welding. This feature helps the student feel as if he/she is working in a real welding environment.

2 AR MIG/FCAW Welding Gun

Markers on the AR MIG/FCAW welding gun allow it to work with the AR system. The gun is connected to a real welding connector in the simulator. MIG/FCAW welding is a semiautomatic process that uses a continuous wire feed as an electrode and an inert (MIG) gas mixture to protect the weld from contamination. The wire can be solid (GMAW) or cored (FCAW). The student begins by selecting the shielding gas, wire type, and diameter. After welding has begun, the student adjusts the wire feed speed on the simulator.

3 AR TIG Torch And Filler Rod

Markers on the TIG (GTAW) torch and AR filler rod allow it to work with the AR system. The torch is connected to a real welding connector in the simulator. The filler material is added to the weld joint by a AR filler rod that is tracked using the AR marker accessory. The student adds filler by dipping the rod into the weld joint, just as in real welding. The AR filler rod is similar in shape, size, and weight to a real filler rod and helps the student become familiar with using this equipment.

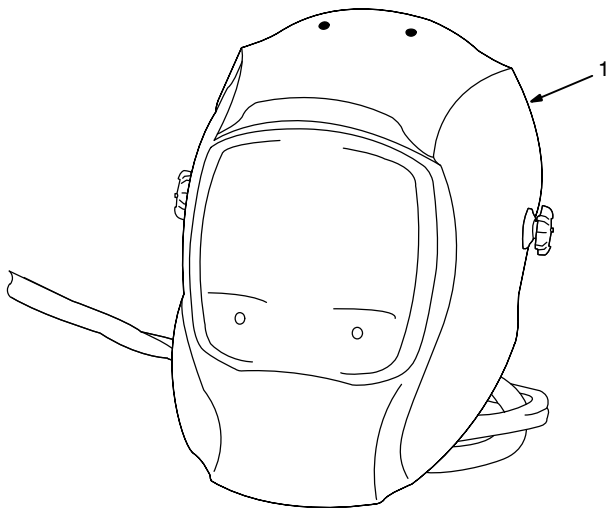
4 AR Workpieces

The AR workpieces are in standard joint configurations (Bead On Plate, T-Joint, Butt Joint, Lap Joint, Pipe-Plate, Pipe-Pipe) and are designed to work with the AR system.

5 Workpiece Stand

Use to hold workpieces in position for simulated flat, horizontal, vertical, or overhead welding.

5-8. AR Welding Helmet



1 AR Welding Helmet

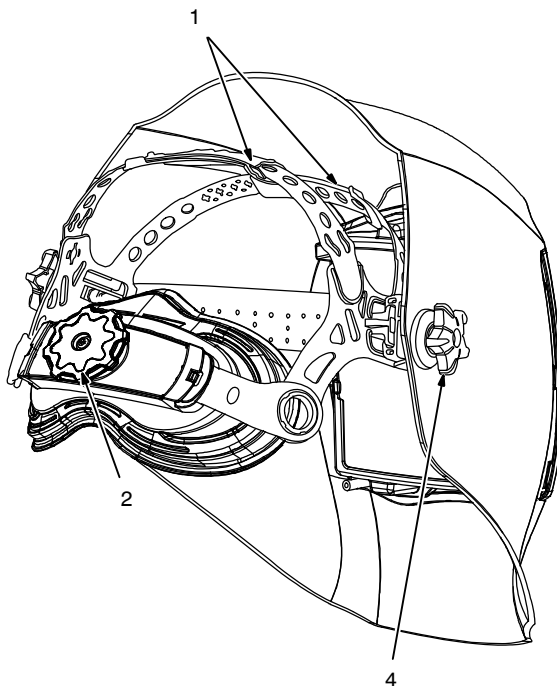
The AR welding helmet has two high resolution micro-cameras and a 5 in. (127 mm) display screen that enhances the augmented reality experience. The AugmentedArc accessories (workpieces, guns, torches, electrode, filler rod) and the real environment are displayed on the helmet screen and these elements interact to create a real time augmented reality to create a realistic welding experience.


The AR welding helmet also includes LED lights (controlled at the simulator) to maintain the stable light environment necessary for the artificial vision technology to work properly.


The AR welding helmet is also equipped with speakers to recreate the sounds emitted during the welding process to make the training more authentic.

161-97

5-9. Making Helmet Adjustments



 *Helmet image is intended only for reference in locating helmet adjustments.*

 *There are four headgear adjustments: headgear top, tightness, angle, and distance.*

1 Headgear Top

Adjusts headgear for proper depth on the head to ensure correct balance and stability.

2 Headgear Tightness


To adjust, turn the adjusting knob located on the back of the headgear left or right to desired tightness.

3 Angle Adjustment (Not Shown)

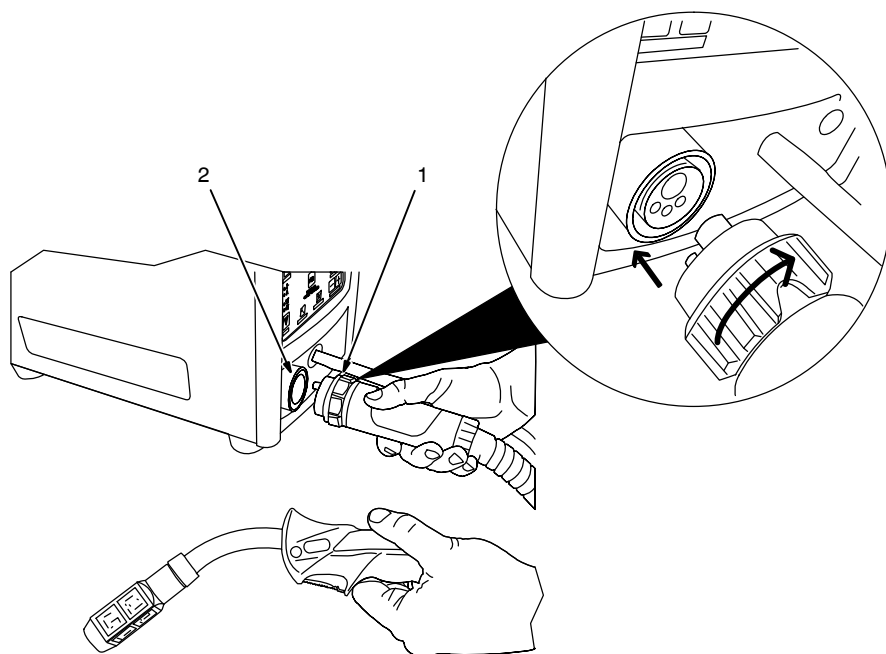
Seven slots on the right side of the headband provide adjustment for the forward tilt of the helmet. To adjust, lift and reposition the control arm to the desired position.

4 Distance Adjustment

Adjusts the distance between the face and the lens. To adjust, press black tabs on the top and bottom of the pivot point and use other hand to slide headgear forward or backward. Release tabs. (Both sides must be equally positioned for proper vision.)

 *Numbers on the adjustment slides indicate set position so both sides can be adjusted equally.*

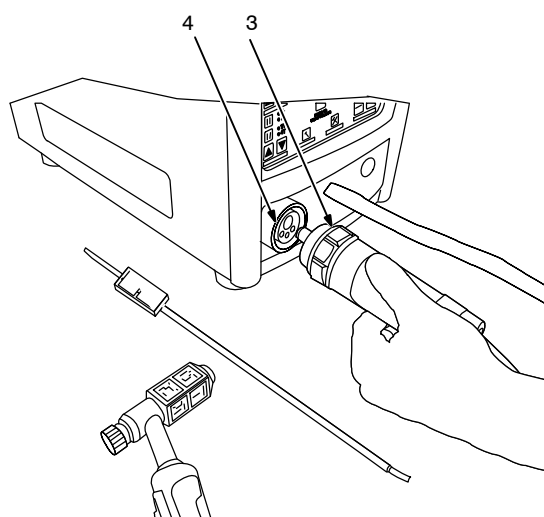
5-10. Connecting Weld Cables



MIG/FCAW Connections

- 1 MIG/FCAW Cable Connector
- 2 MIG/FCAW Receptacle

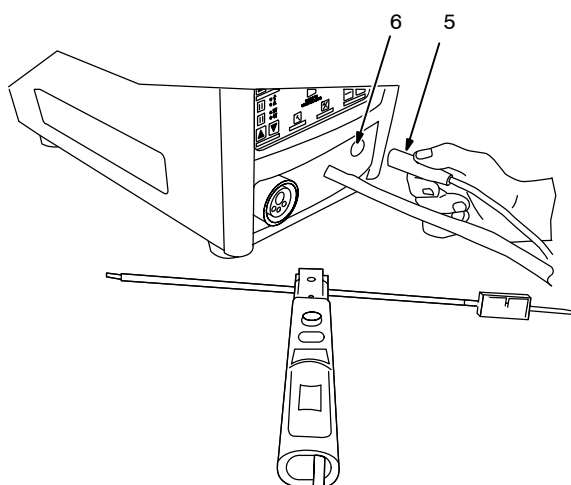
Align pins in connector with holes in receptacle. Insert connector in receptacle and tighten collar clockwise.



TIG Connections

- 3 TIG Cable Connector
- 4 TIG Cable Receptacle

Align pins in connector with holes in receptacle. Insert connector in receptacle and tighten collar clockwise.



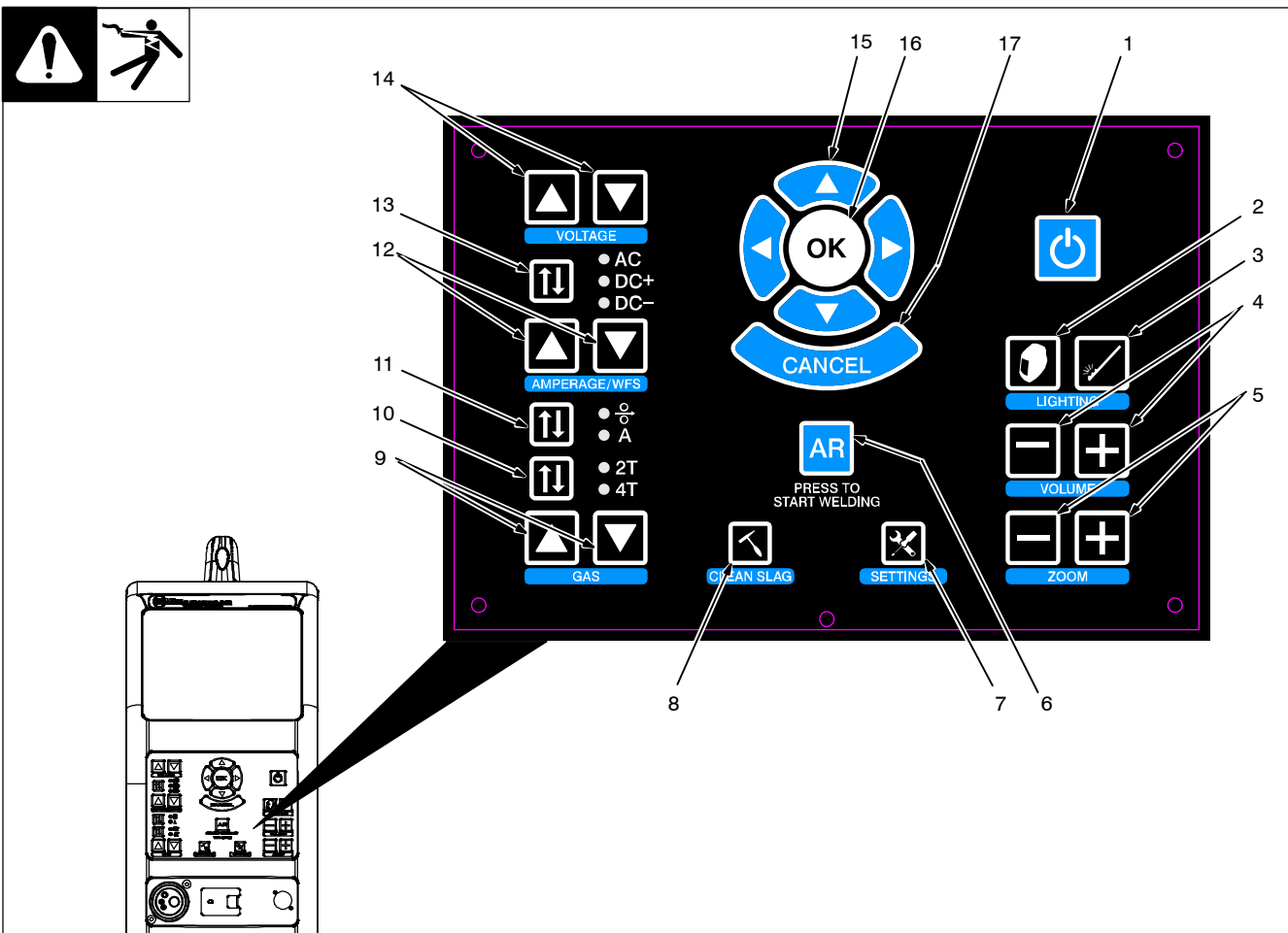
Stick Connections

- 5 Stick Cable Connector
- 6 Stick Cable Receptacle

Align pins in connector with holes in receptacle. Insert connector in receptacle.

SECTION 6 – SYSTEM CONTROLS AND COMPONENTS

6-1. Simulator Controls



Ref. 276687-A

⚠ Do not use the welding simulator if you are light sensitive or affected by video, flashing lights, or other visual stimuli. Stop using simulator and consult your physician if you experience vision problems, nausea, headaches, dizziness, vertigo, or other conditions.

ℹ For best performance, keep helmet, guns, torches, and workpieces free of dust and debris. Clean components with a damp cloth. (Do not use chemicals, solvents, or abrasives to clean markers.)

1 Power On/Off Button

Use button to turn system on and off.

2 Helmet Light Control

Use button to turn helmet light on and off, and change intensity of light.

3 Filler Rod Light Control (TIG)

Control not used with latest software.

4 Volume Adjustment Buttons

Use buttons to increase or decrease volume of helmet speakers

5 Display (Zoom) Adjustment Buttons

Use buttons to magnify images on display screens.

6 Augmented Reality (AR) Button

Use button to turn augmented reality feature on and off.

7 System Settings Button

Use button to access system settings menu. Use the settings menu to change language, units of measure (standard or metric), camera settings and other parameters.

After starting an exercise, use the System Settings button to adjust video device settings and optimize AR tracking for the room lighting conditions (see Section 8-7).

ℹ Some settings can only be changed by the system administrator.

8 Clean Slag Button

Use button to remove slag from augmented reality workpiece when Stick and FCAW welding. Slag must be cleaned for test results to be displayed.

9 Shielding Gas Flow Adjustment Buttons

Use buttons to increase or decrease the shielding gas flow for the MIG and TIG weld processes.

10 Gun Trigger Selection Button

Use button to select either two-step or four-step trigger operation.

11 Amperage/Wire Feed Speed Selection Button

Use button to select the weld parameter (amperage or wire feed speed) to be adjusted (see Item 12).

12 Amperage/Wire Feed Speed Adjustment Buttons

Use buttons to increase or decrease amperage or wire feed speed (see item 11).

13 AC/Polarity Selection Button

Use button to select AC weld output or DCEP or DCEN weld polarity.

14 Voltage Adjustment Buttons

Use buttons to increase or decrease weld voltage.

15 System Navigation Buttons

Use buttons to navigate AR system programs and select menu items.

16 OK (System Selection) Button

Use button to activate selected menu items.

17 System Cancel Button

Use button to stop the AR program or activity in use, or return to the previous screen.

SECTION 7 – OPERATION

⚠ Do not use the welding simulator if you are light sensitive or affected by video, flashing lights, or other visual stimuli. Stop using simulator and consult your physician if you experience vision problems, nausea, headaches, dizziness, vertigo, or other conditions.

☞ A MIG/FCAW welding simulation is shown in these examples. Setup and adjustments are similar for other welding processes.

7-1. Equipment Setup

- Assemble AugmentedArc training system. Install system in proper location and near 120 volt AC power source (see Section 5-1).
- Connect desired gun or torch to simulator (see Sections 5-7 and 5-10).
- Connect simulator and router power cords to 120 volt AC receptacles.
- Place simulator Input Power switch in On position (on back of simulator). Press router Power switch. Press and hold On-Off switch on front of simulator until simulator turns on. For Classroom applications, also place controller Input Power switch (on back panel) in On position (see Section 5-4). Press and hold controller Power On/Off switch (on front panel) until unit turns on.

7-2. Getting Started

A. Login Screens

Use System Navigation buttons to select guest or user name from Login menu. Press OK.

☞ To create a new user, see Section 9, Using The Teacher Software.

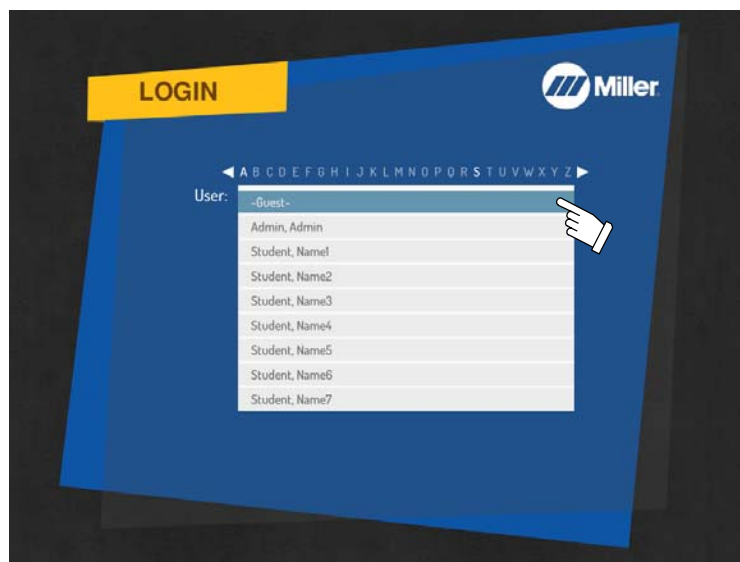


Figure 7-1. User Selection Screen

Use System Navigation buttons to enter User password. Each button represents a specific numeral (1 – 4) as shown in Figure 7-2. (The default Admin user password is 1111.) Press OK.

☞ In classroom applications, passwords are established by the instructor. Guest users do not need a password.

☞ The default Admin user password is 1111.

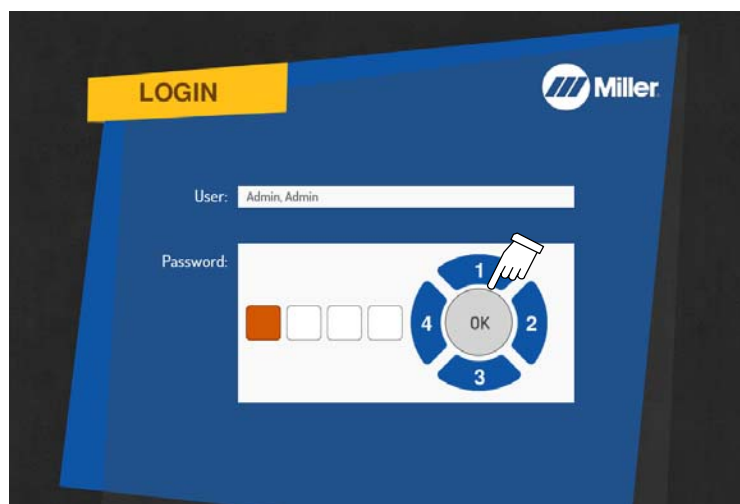


Figure 7-2. Password Screen

B. Course Selection

Use System Navigation buttons to select desired course (Figure 7-3). Press OK.

Course selection will vary for each user.

Press the Cancel button at any time to stop the program and return to the previous screen.

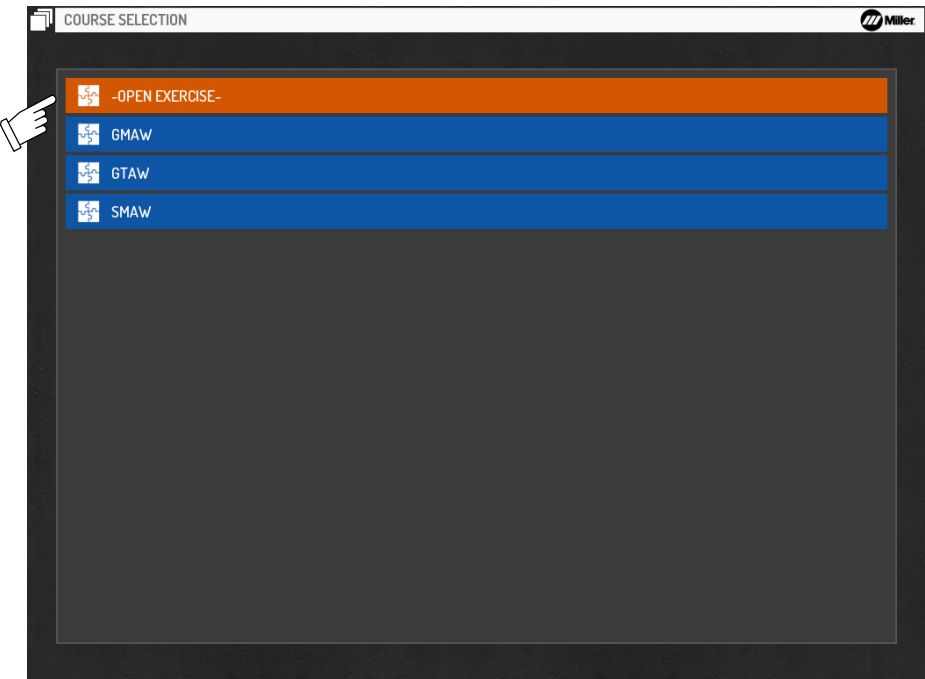


Figure 7-3. Course Selection Screen

Use Navigation buttons to select (Start) a new exercise session or review previous sessions (under the History tab). See Figure 7-4. Press OK.

The History feature is not available to Guest users.



Figure 7-4. Activity Selection Screen

Use Navigation buttons to select or acknowledge the weld process, experience level (Beginner, Intermediate, Advanced), technique, weld pattern, gun/torch position, joint, material thickness, electrode diameter, and other parameters as applicable (Figure 7-5).

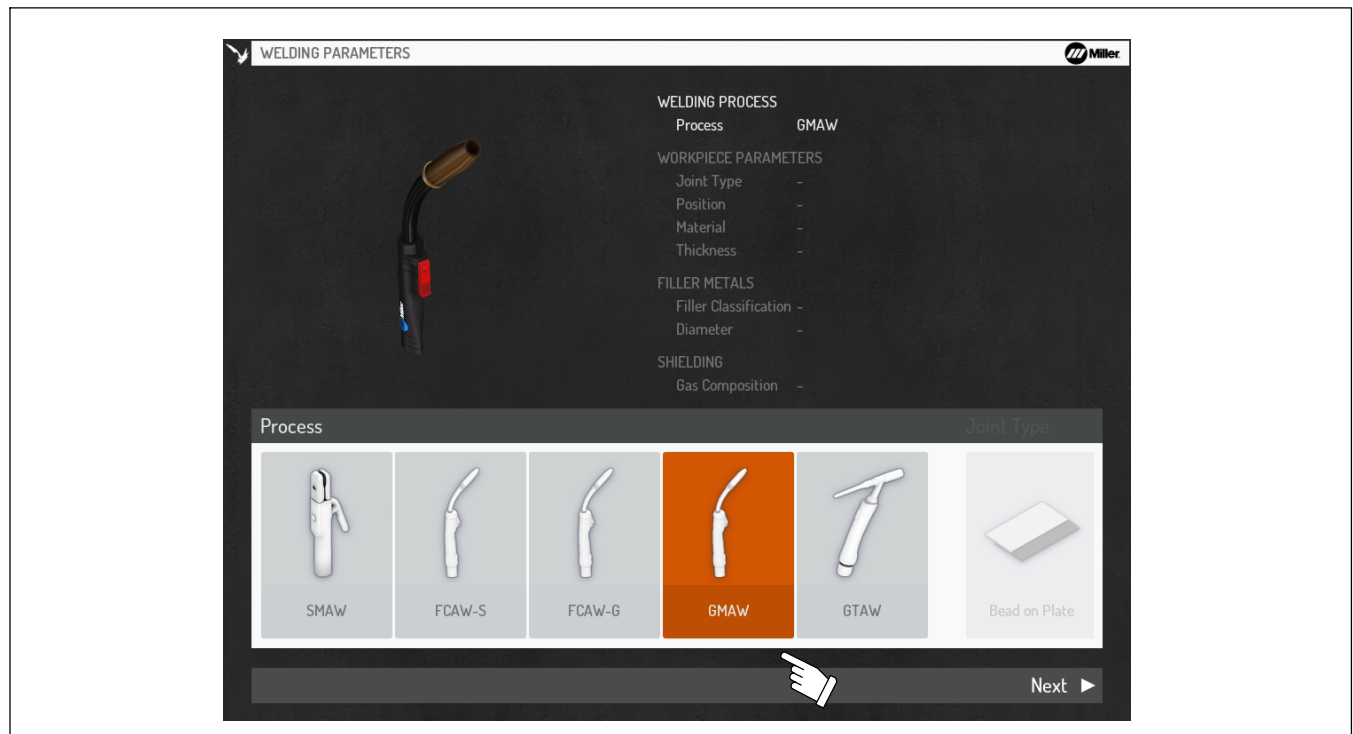


Figure 7-5. Welding Parameters Screen

C. Lighting Calibration

Depending on the selected Lighting Calibration option for the system (see Section 8-2F), the user may be prompted to perform a lighting calibration procedure before starting the exercise. The lighting calibration will adjust the video device settings (temperature, intensity) based on the room lighting conditions.

Ensure helmet illumination is turned on (see Section 6-1).

Press the AR button to begin the process.

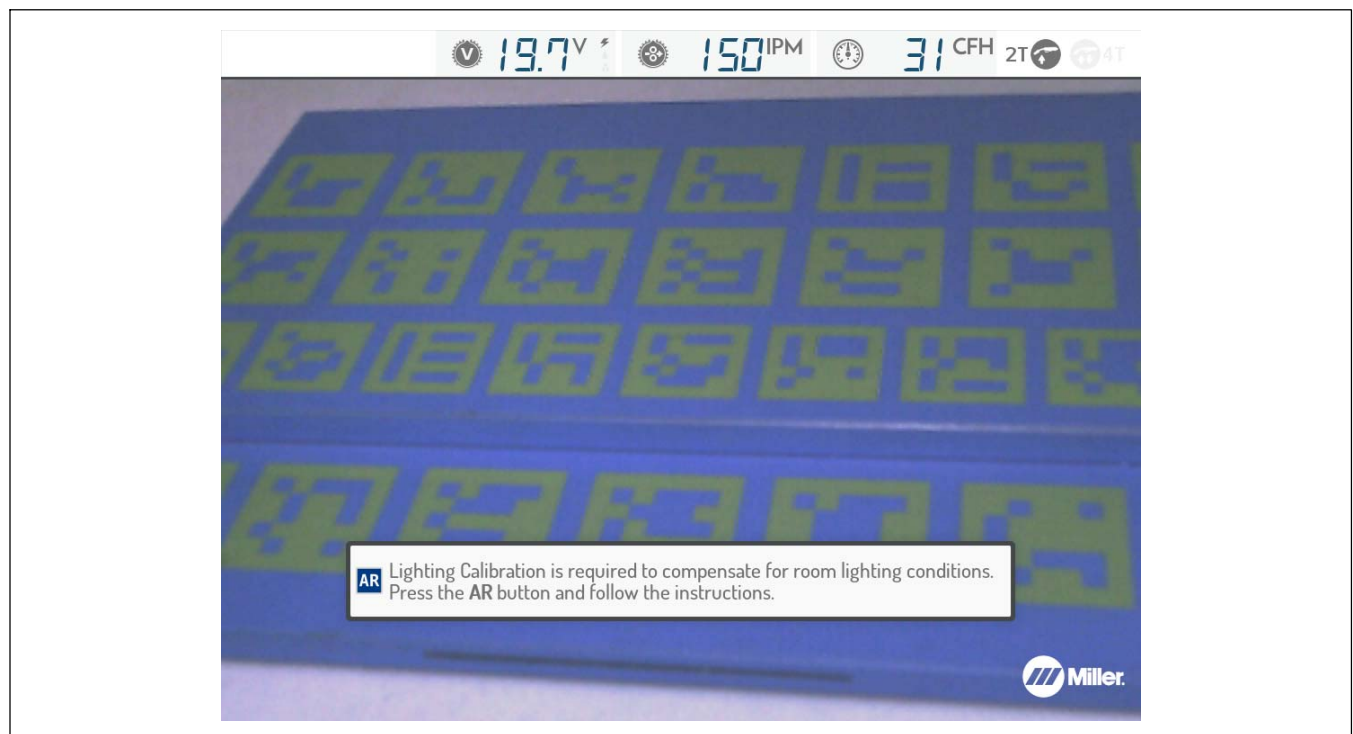


Figure 7-6. Lighting Calibration Screen

A dashed white circle will appear in the middle of the screen. Face the helmet toward the coupon. Aim the helmet so that the dashed white circle is aligned with the red solid circle. Adjust the helmet's distance from the coupon so that both circles have the same size.

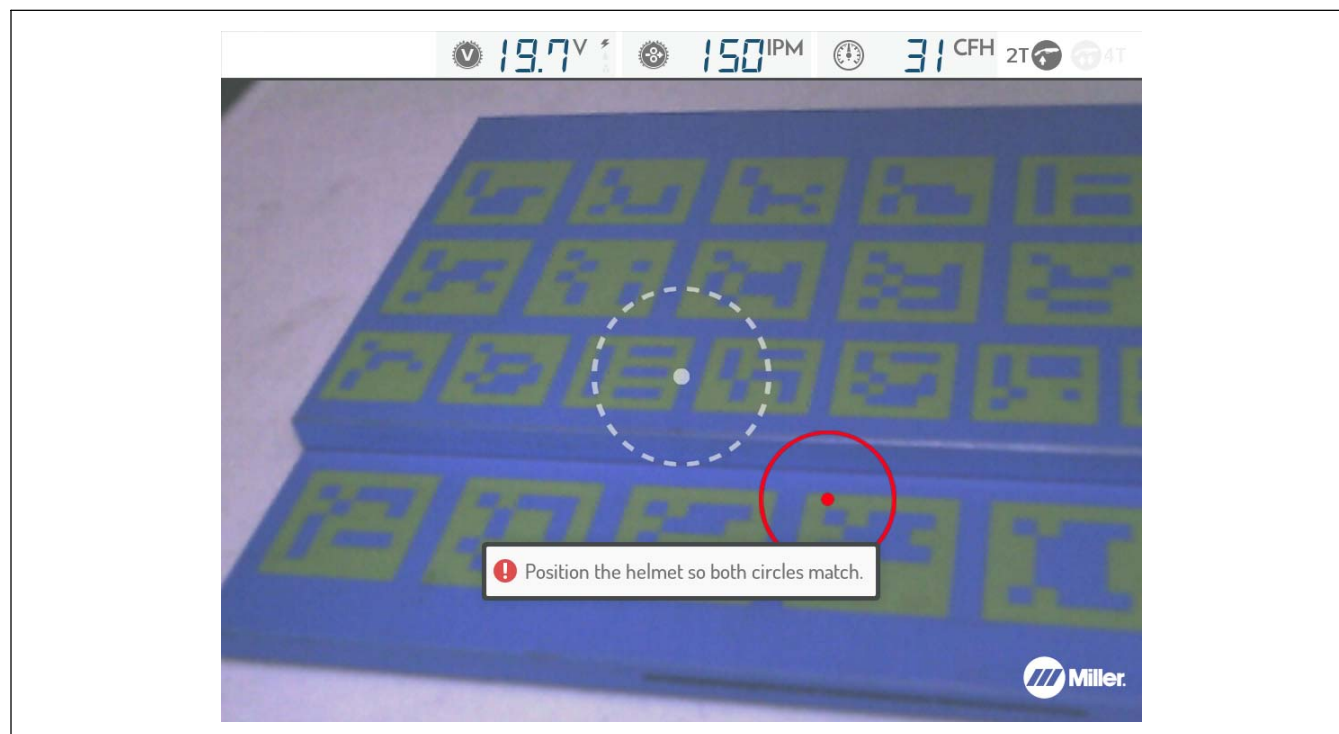


Figure 7-7. Lighting Calibration Circles

When both circles match, the lighting calibration process will be performed automatically. Be sure to maintain the alignment throughout the process.

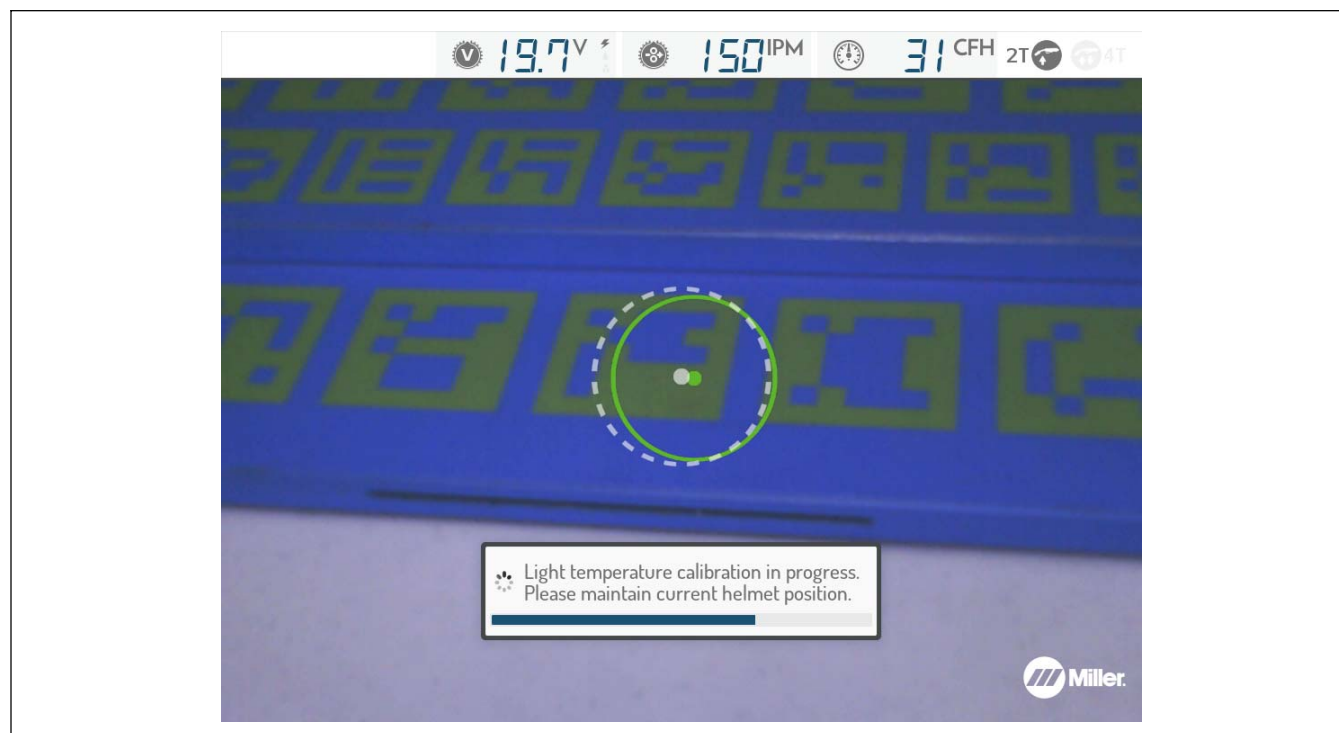


Figure 7-8. Lighting Calibration In Progress

A notification indicates when the process has completed successfully.



Figure 7-9. Lighting Calibration Successful

The Lighting Calibration process can be manually initiated at any point by pressing the **Settings** button (see Section 8-7).

D. Correcting Improper Weld Setting

Ensure helmet illumination is on (Section 6-1).

Look at the workpiece through the AR helmet and tap the gun trigger (MIG/FCAW/TIG) or press the AR button (MIG/FCAW/Stick/TIG). It may be necessary to adjust video device settings or helmet lighting to compensate for workplace conditions (see Section 6-1). The Display Screen shows weld voltage, wire feed speed, gas flow, trigger control selection, and other settings. Settings highlighted in red are incorrect for the application and need to be changed. The arrows displayed on the screen indicate whether to increase or decrease the setting. Equipment settings must be correct for the process before welding can begin (unless this default setting is overridden by instructor or administrator).

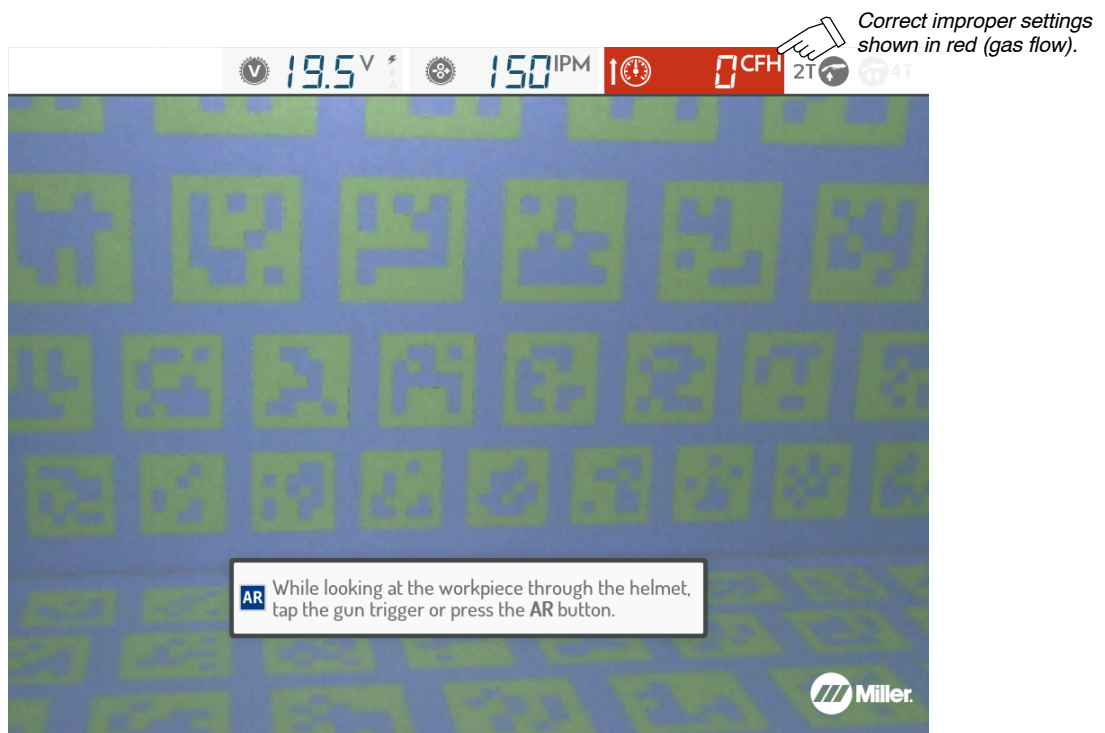


Figure 7-10. Example Of Improper Weld Settings

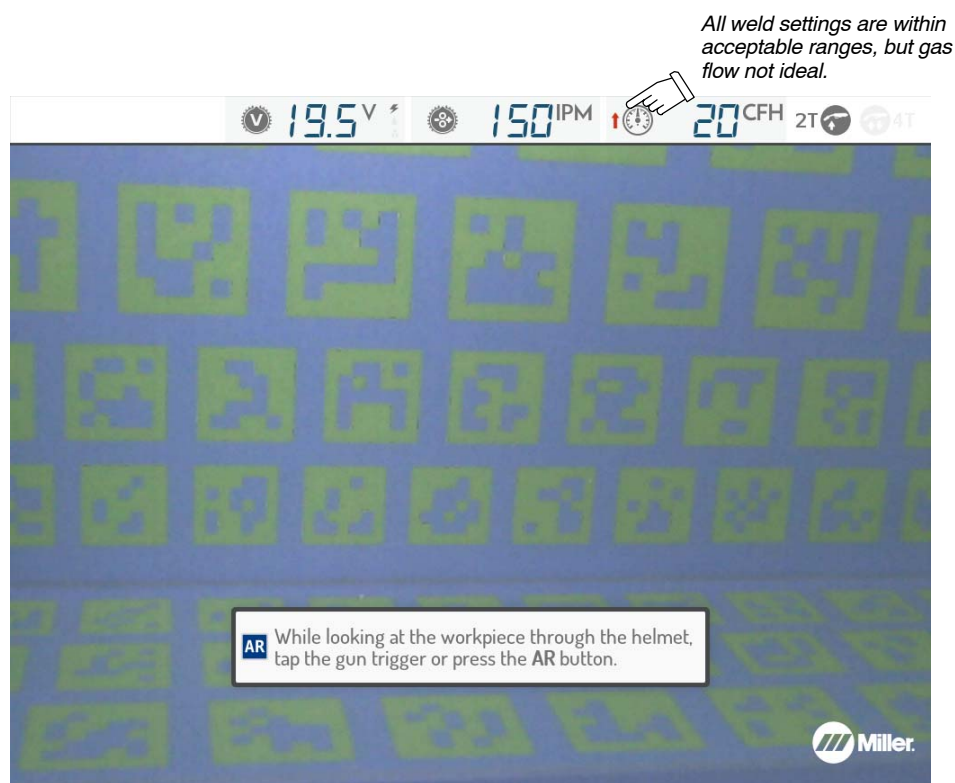


Figure 7-11. Example Of Acceptable Weld Settings



Figure 7-12. Example Of Ideal Weld Settings

E. Determining Correct Position Of MIG Gun/Electrode And AR Helmet

Place the gun/electrode at the simulated weld joint (visible through the helmet). The screen will display an error message if the system is not tracking the gun/electrode. Adjust gun/electrode position, helmet lighting, and helmet position to clear the tracking error. Use the simulated guides to help you adjust the gun/electrode angle, direction, and contact tip to work distance (CTWD) to acceptable limits. The guide(s) will display in red if the gun/electrode is not in the correct position; guides shown in green indicate the gun position is acceptable (Figure 7-13).

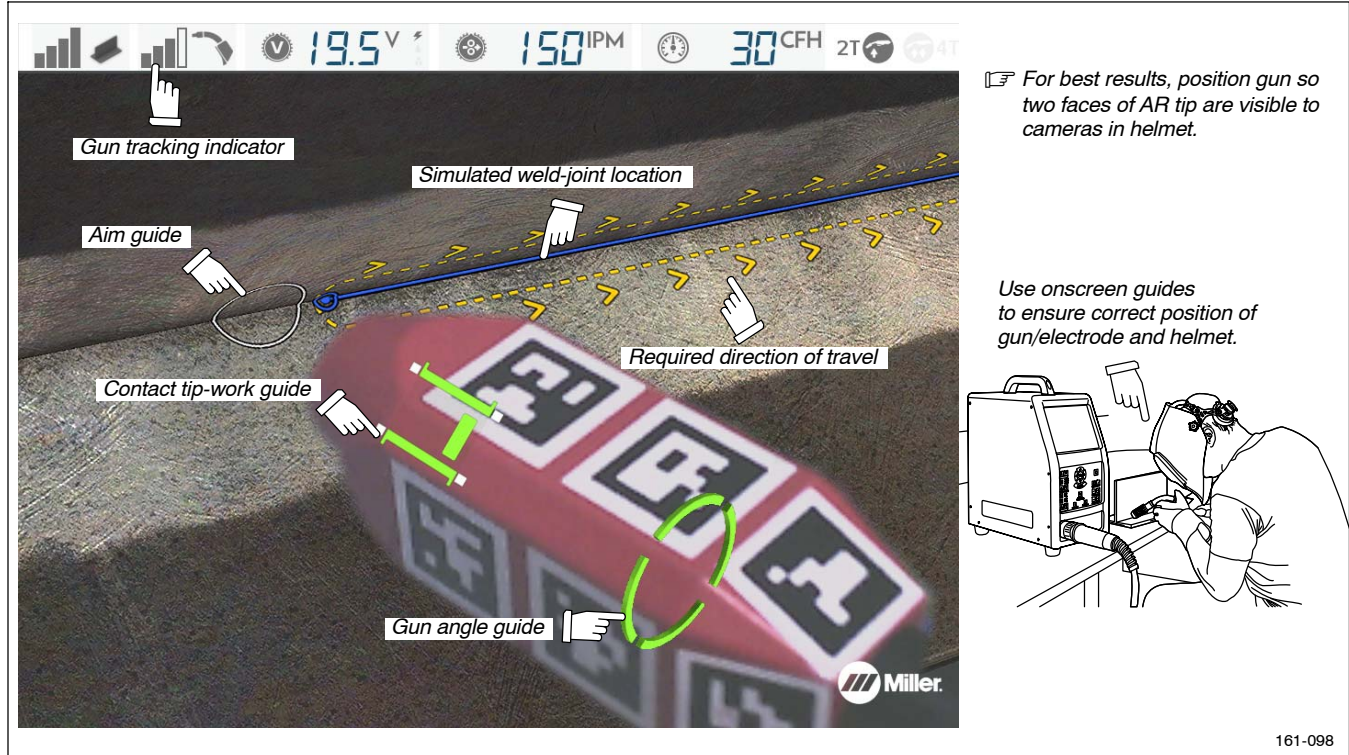


Figure 7-13. Review Gun/Electrode Positioning Guides Before Welding

Position gun/electrode near weld joint. Pull trigger and move gun along entire length of weld joint in the correct orientation and speed as indicated on the helmet screen. Pay close attention to on-screen guides while welding (Figure 7-14 thru Figure 7-16) and adjust technique as necessary. Release trigger and check score (see Section F). For stick welding, when the marker block is seen to be close enough to the sticker markers on the electrode holder, the weld simulation and electrode retraction will automatically pause. To continue, reset the electrode position within the electrode holder and resume simulated welding.

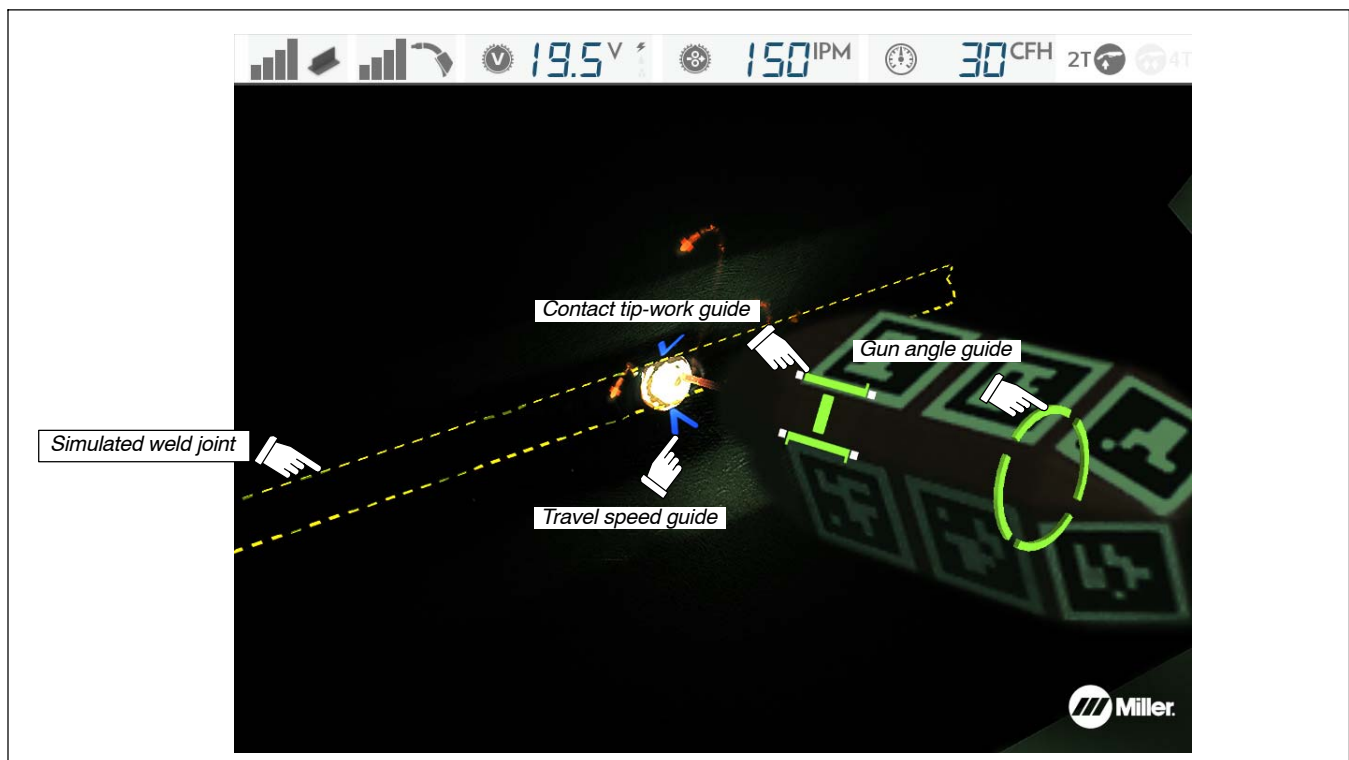


Figure 7-14. Gun/Electrode Positioning Guides Displayed While Welding

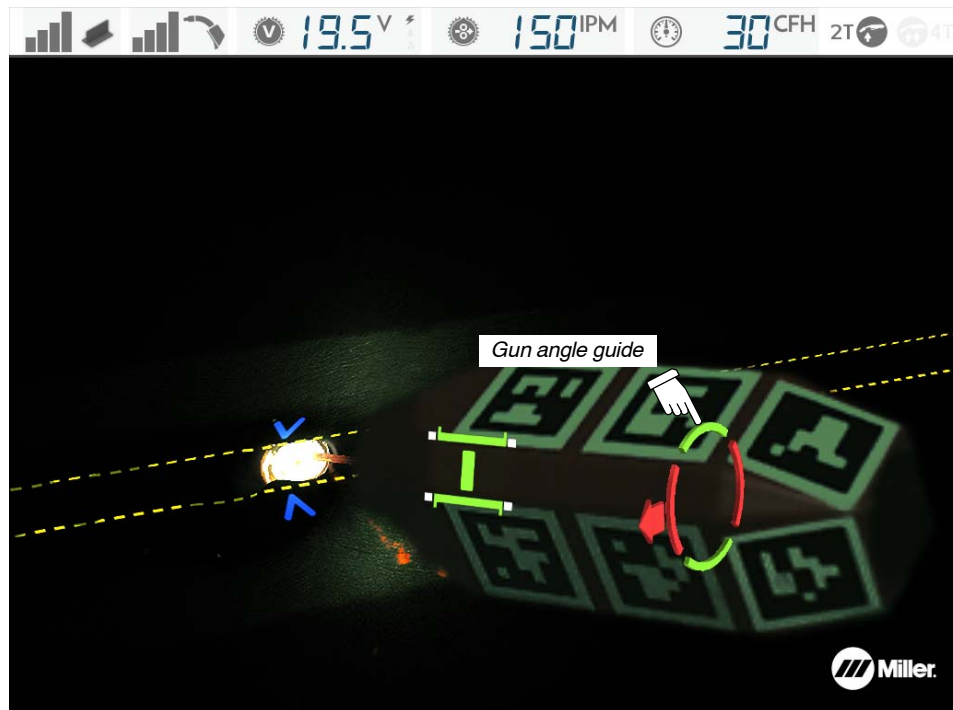


Figure 7-15. Gun/Electrode Travel Angle Error



Figure 7-16. Arrows Indicating Error In Helmet Position

F. Course Analysis

After completion of the weld, examine scores in the Technique Parameters (work angle, travel angle, CTWD, travel speed, aim) and equipment settings to determine areas of failure. Failing scores are highlighted in red. Student must use the correct equipment settings and achieve scores above the target score (determined by the instructor) to pass the test. The colored lines shown on the workpiece correspond to the Technique Parameters shown in the scoring column. Select an individual Technique Parameter to display only that specific parameter on the work piece. Further analyze the test by using the WPS Summary, Change View, and Replay options displayed at the top of the screen.

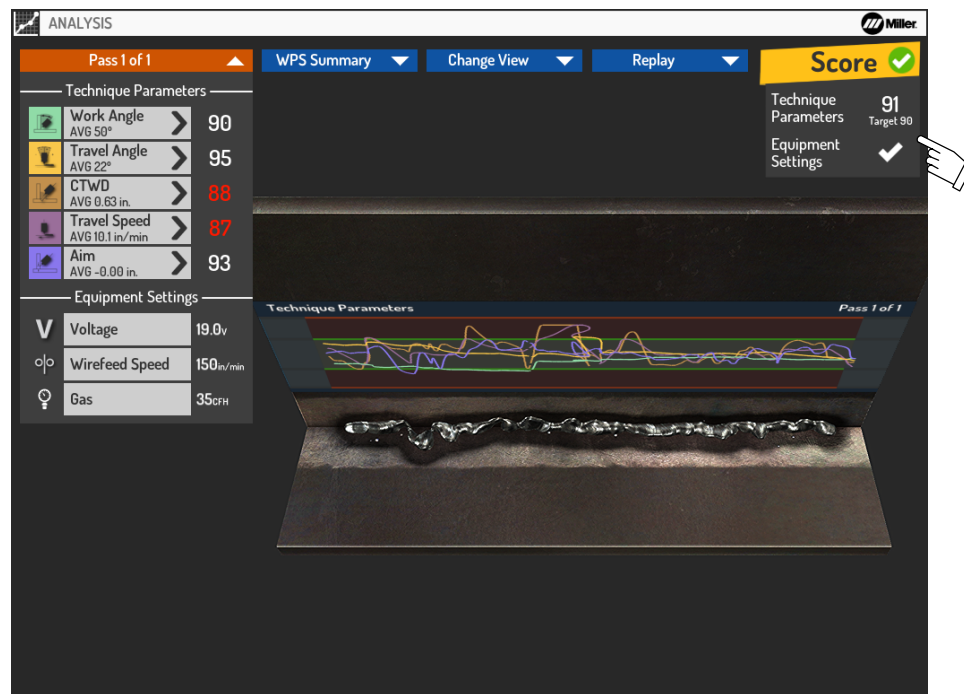


Figure 7-17. Results Of Welding Exercise

Press Cancel button to perform another simulated test, or choose a different assignment.

SECTION 8 – SYSTEM SETTINGS

8-1. Accessing Administrator Home Screen

Log in as administrator to access the Administrator home screen (Section 7-2). Select **System Settings** (Figure 8-1) and press OK.

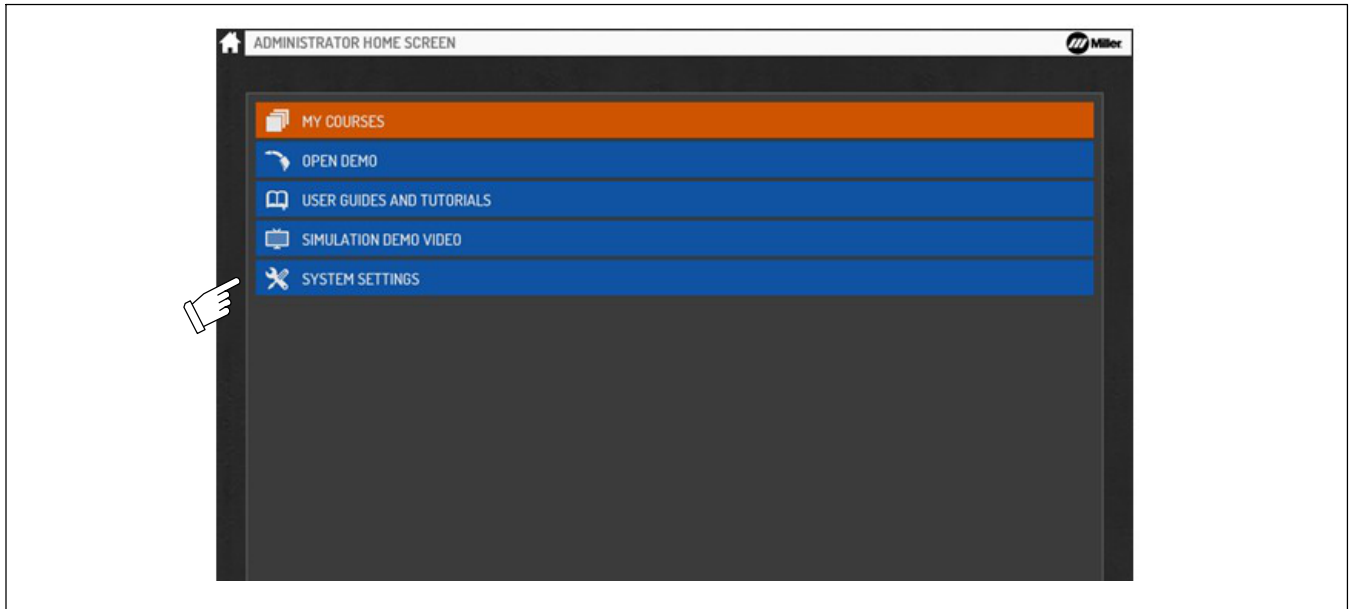


Figure 8-1. Accessing System Settings Screen

8-2. Changing System Configuration

A. Changing System Language Setting

Select **Change Language** and press OK to select a new language (Figure 8-2). Press Cancel to return to the menu.

English, Spanish, and French are currently available.

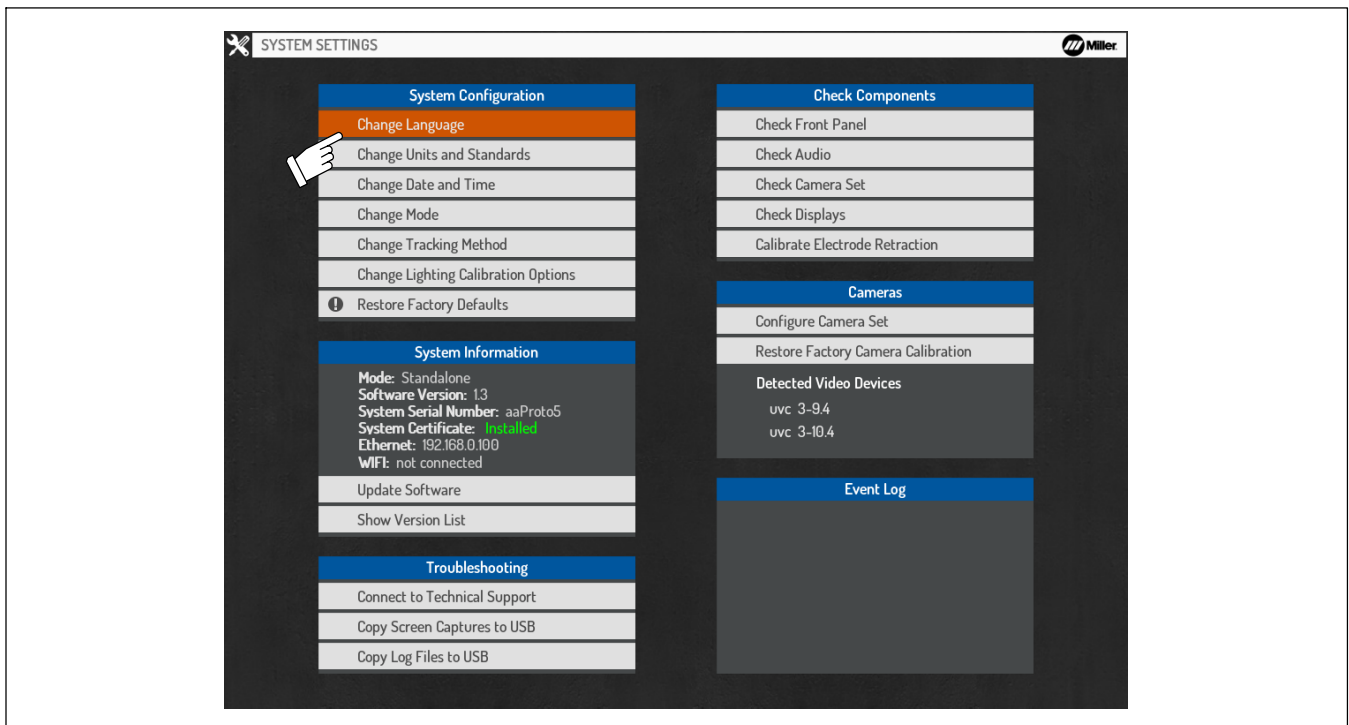


Figure 8-2. Changing Language Setting

B. Changing System Units And Standards

Select **Change Units and Standards** and press OK to change the units of measure (Imperial or Metric) or to change naming conventions. Select **Apply** and press OK after making changes, or press Cancel to exit the menu without saving.

The Mixed Standard naming convention will display both standards on the welding position selection screen (PB/2F).

C. Changing System Date And Time

Select **Change Date And Time** and press OK to change the year, month, day, and time. Select **Apply** and press OK after making changes, or press **Cancel** to exit the menu without saving.

D. Changing System Mode

Before changing to Classroom mode, ensure the system is connected as shown in Section 5-4. The controller and the simulator must have the same version of software installed (see Section 8-3).

Select **Change Mode** and press OK to change the system configuration to Standalone or Classroom. Use Standalone mode for a setup with a single simulator. Use Classroom mode for a setup with multiple simulators and a controller. Select **Apply** and press OK after making changes, or press Cancel to exit the menu without saving.

E. Changing Tracking Method

Select **Change Tracking Method** and press **OK** to change Mono and Stereo tracking for each process and change between LED and Marker tracking for the Stick Electrode and TIG Filler Rod. Mono tracking uses only the left camera for tracking, which means that if the marker on an object is viewable in the helmet display during the exercise that the object will be tracked. Stereo tracking requires both the left camera and right camera to view the marker on an object for the object to be tracked. Stereo tracking is recommended and results in the best accuracy of the tracked technique parameters. Mono tracking has lower accuracy but may reduce tracking issues.

F. Changing Lighting Calibration Options

Select **Change Lighting Calibration Options** and press OK to change the frequency with which the system prompts the user to perform the lighting calibration process. See Section 7-2C.

G. Restoring Factory Configuration

To reset system to the original factory configuration, select **Restore Factory Defaults** and then press **OK** (Figure 8-3). A confirmation message will be displayed. Make a selection to either proceed or cancel.

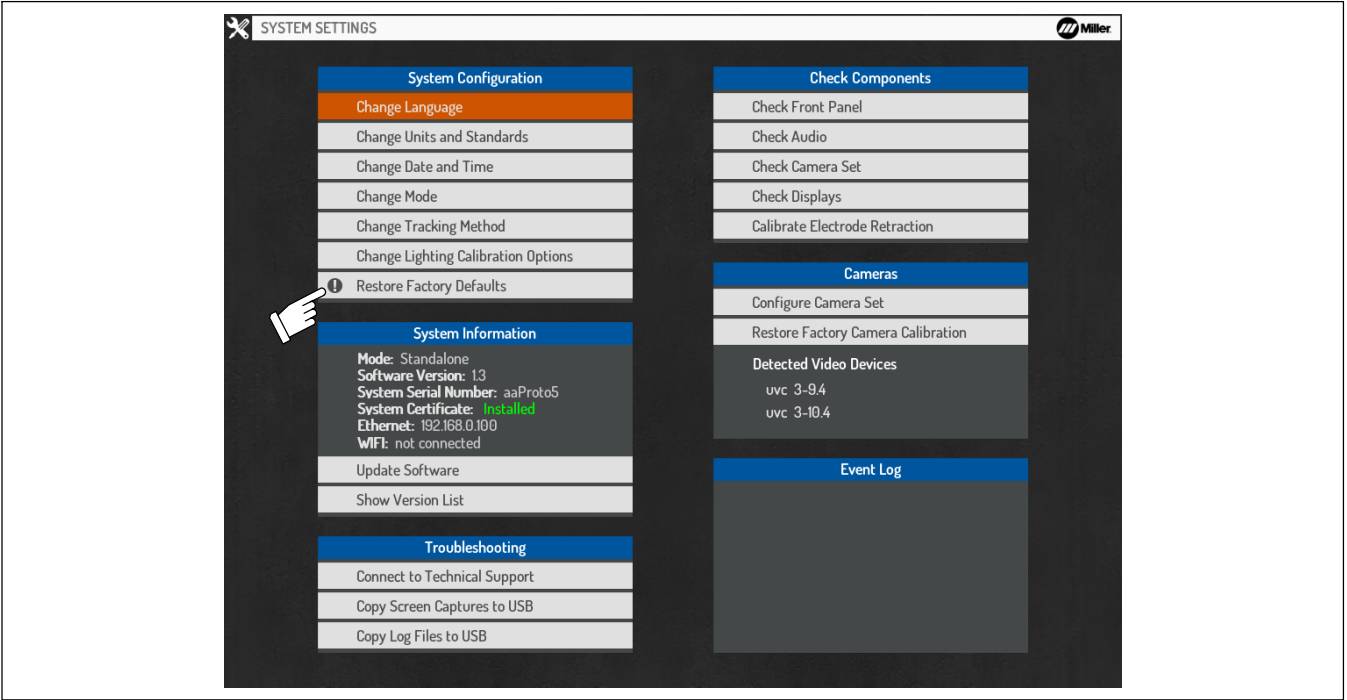


Figure 8-3. Restoring Factory Configuration

For a system in Classroom Mode, the restore process will restore the simulator to original factory conditions, but will not affect the system curriculum (courses, students, student history). These changes can only be made by using the Teacher Software (see Section 9). For a system in Standalone Mode, a number of reset options are provided (see Figure 8-4). Selecting **System Configuration Only** will restore the system to original factory conditions, but will not affect the system curriculum. Selecting **Curriculum, Students, & Test Data Only** will erase all customized system content and restore the system content to the factory defaults. Selecting **Both** will restore the system configuration and content to original factory conditions.

This process will not affect the system calibration (cameras, electrode retraction rate, etc.).

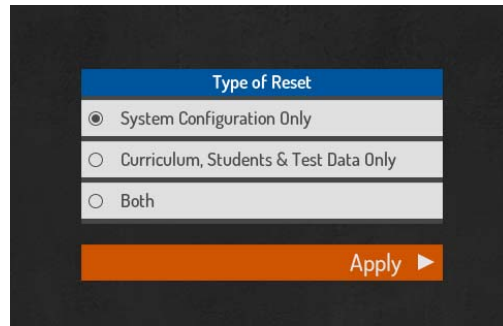


Figure 8-4. Type Of Reset

8-3. Software Updates

Software update files and detailed update instructions can be found online at <https://www.millerwelds.com/aasoftware>

A. Software Updates – Stand-Alone Mode

During start-up, the system automatically installs software updates provided through an Internet connection (if available) or USB memory stick (if connected).

To manually initiate a software update, select **Update Software** and press OK (Figure 8-5). Select **Internet** if the system is connected to the Internet; select **USB Stick** if the software will be installed from a USB memory stick (connected to the USB receptacle on the back of the simulator) (Section 5-2). Press OK after making changes, or press Cancel to exit the menu without saving.

After a successful software update, a confirmation message will be displayed on the Login screen indicating the new version of software installed. Be sure to also update the Teacher Software to the latest version to maintain compatibility (see Section 9-1).

B. Software Updates – Classroom Mode

During start-up, the controller automatically installs software updates provided through an Internet connection (if available) or USB memory stick (if connected). Controller software installation may take up to five minutes. After a software update is installed on the controller, restart each simulator to automatically download the updated software from the controller.

To manually download the updated software from the controller to the simulators, select **Update Software** and then press OK, and then select **Update from Server**. Press OK after making changes, or press Cancel to exit the menu without saving.

After a successful software update, a confirmation message will be displayed on the Login screen indicating the new version of software installed. Be sure to also update the Teacher Software to the latest version to maintain compatibility (see Section 9-1).

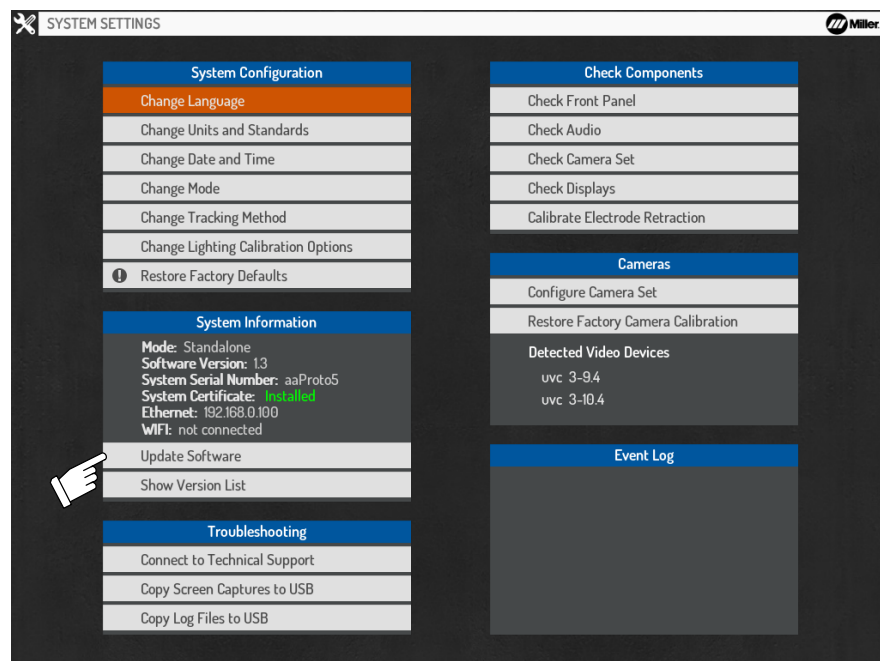


Figure 8-5. Updating Software

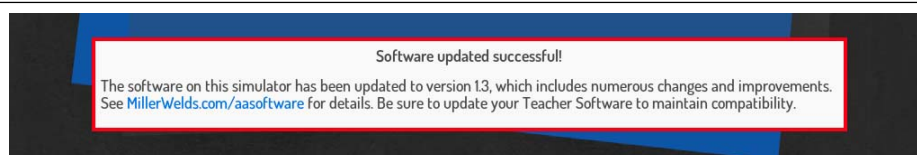



Figure 8-6. Software Update Confirmation Message

8-4. Troubleshooting

Select **Connect to Technical Support** and press OK to allow Miller technical support personnel to access the system for troubleshooting (Figure 8-7). Select **Yes** (to request assistance) or **No** (to cancel request for assistance), and then press OK. Press Cancel to exit the menu without saving.

 *Select this option only if instructed by Miller technical support.*

Select **Copy Log Files to USB** if you recently experienced a system issue or software crash. This will save the log files to a USB drive connected to the USB port located on the rear of the system.

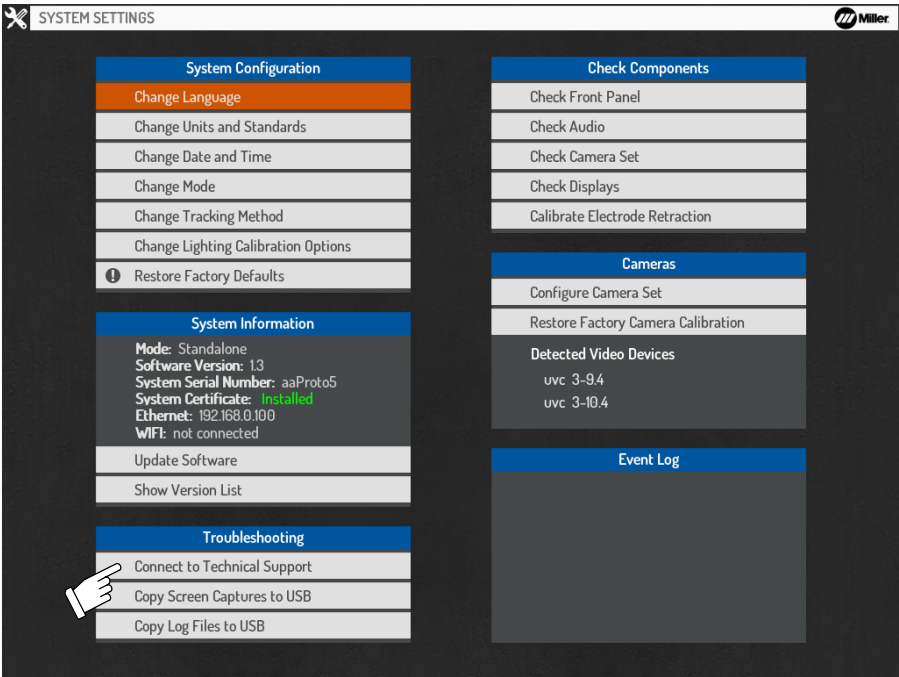


Figure 8-7. Connecting To Miller Technical Support

8-5. Check Components

A. Checking Front Panel Functions

Select **Check Front Panel** (Figure 8-8) and then press OK to access test screen. Use test screen to verify all front panel buttons and the MIG Gun/TIG torch triggers are functioning properly. Quickly press Cancel twice to exit the menu.

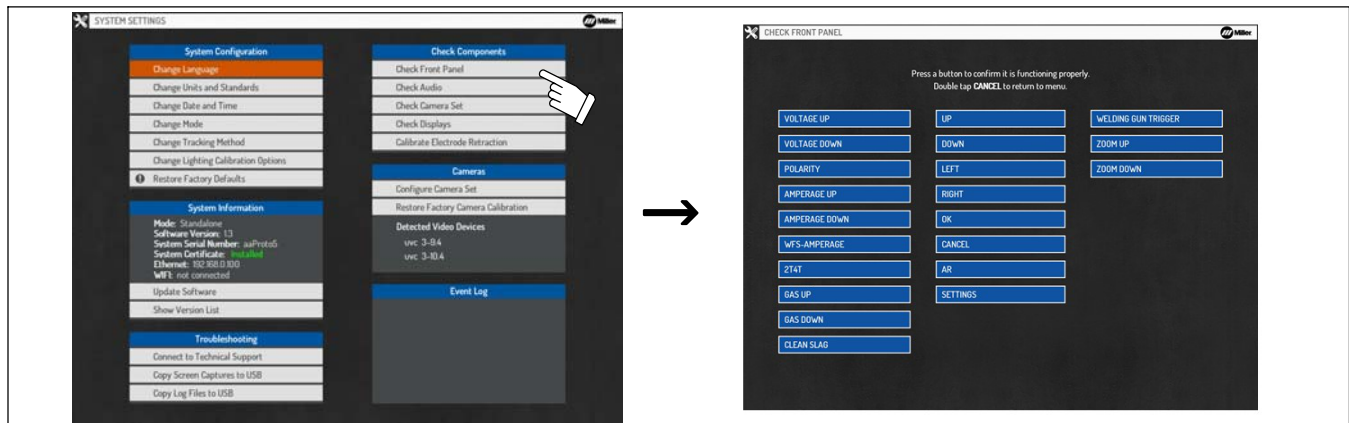


Figure 8-8. Checking Simulator Front Panel Controls And Gun/Torch Triggers

B. Checking Audio

Select **Check Audio** to verify proper function of the helmet speakers. Press OK. Press Cancel to exit the Menu.

C. Checking Displays

Select **Check Displays** to verify proper function of the simulator and helmet displays. When this option is selected, a solid white screen should appear on both displays. Press Cancel to exit the Menu.

D. Checking Camera Set

Select **Check Camera Set** to verify the left and right cameras are functioning properly (Figure 8-9). Press OK.

Do not make video adjustments unless instructed by Miller technical support.

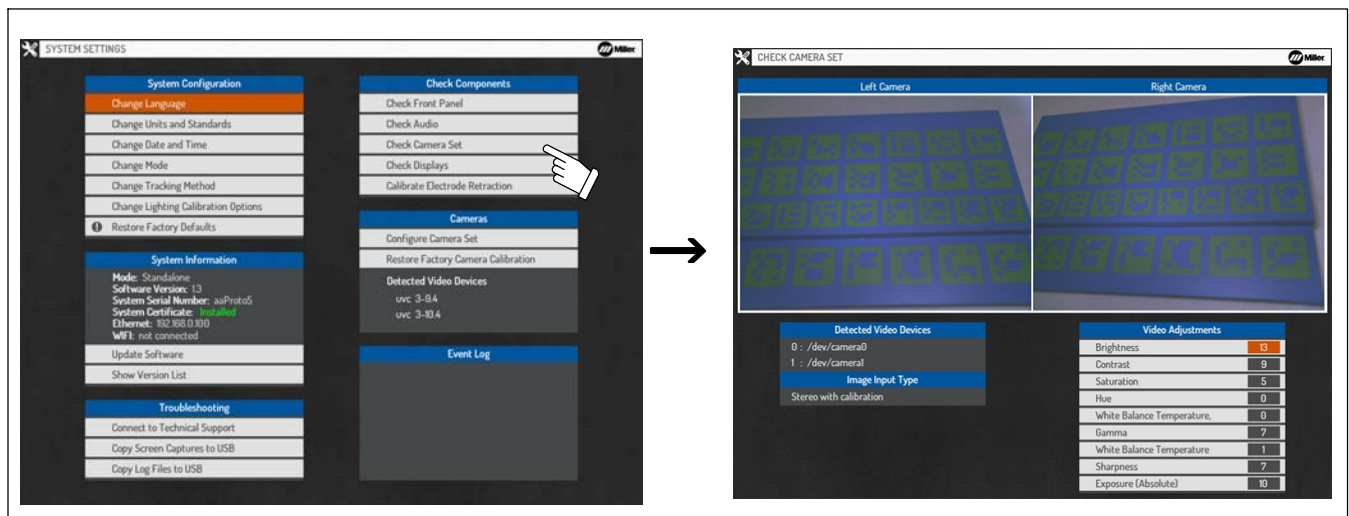


Figure 8-9. Checking Camera Set

E. Calibrating Electrode Retraction

Select **Calibrate Electrode Retraction** (Figure 8-10) and press OK to perform the following functions for the AR Stick electrode:

- Recalibrate the electrode retraction rate. (Recalibrate electrode retraction rate only when instructed by Miller technical support.)
- Test electrode retraction functionality.
- Adjust the electrode rate scaling factor. The retraction rate depends on the parameters of the exercise but the rate can be scaled to be slower (80%) or faster (120%), as desired. To adjust the scaling factor, select **Increase Scaling Factor** or **Decrease Scaling Factor**, and then press OK to change the value. Press OK after making changes, or press Cancel to exit the menu without saving.



Figure 8-10. Calibrating Stick Electrode

Notes

8-6. Cameras

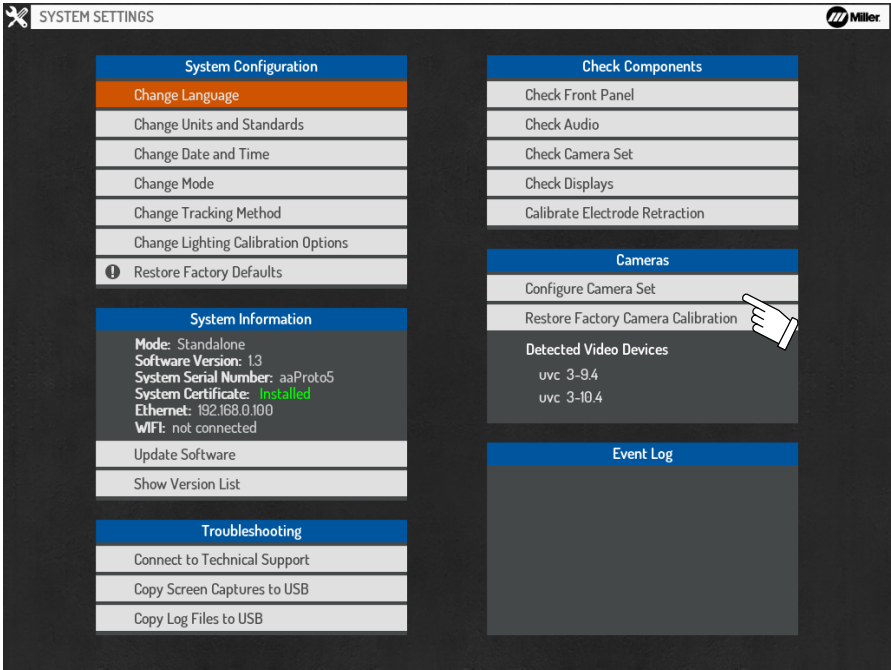


Figure 8-11. Camera Settings

A. Configure Camera Set

Selecting Configure Camera Set begins the processes required to calibrate the helmet's cameras. The processes include Configure Camera Set, Check Camera Set, Focusing Cameras, and Calibrating the Cameras.

Confirm the left and right camera views are displayed properly (note: left and right are from the perspective of the user wearing the helmet). If the camera views are swapped, select **Swap Left and Right Cameras**. If the left or right camera view is rotated, select the appropriate options to rotate the left or right camera to its proper orientation. The resolution can also be changed, but 800x600 will provide for the most consistent and accurate tracking experience. Select **Next** to proceed.

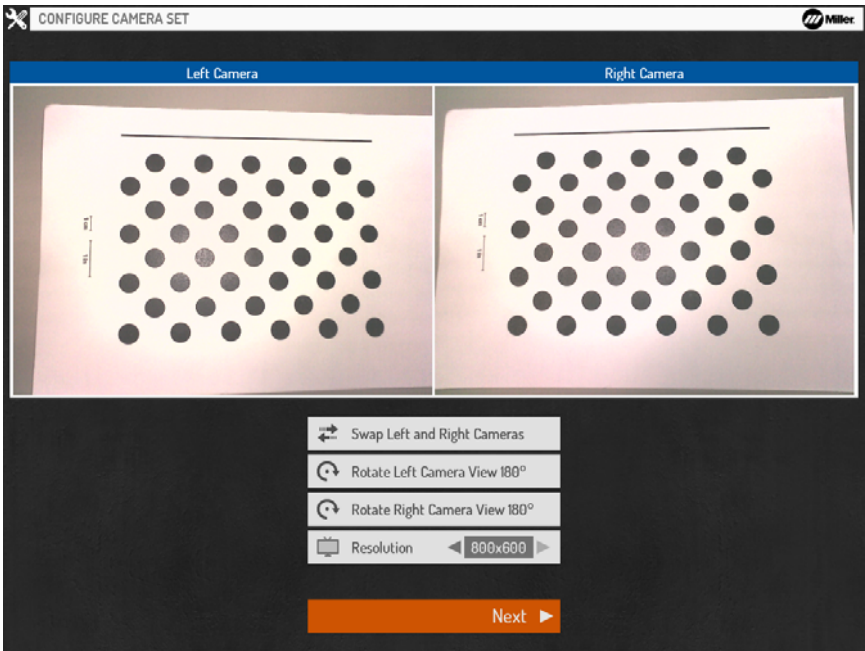


Figure 8-12. Configuring Camera Set

1. Check Camera Set

Adjust the Intensity and Color Temperature as needed until the displayed images closely match how they appear in the real world. Select **Next** to proceed.

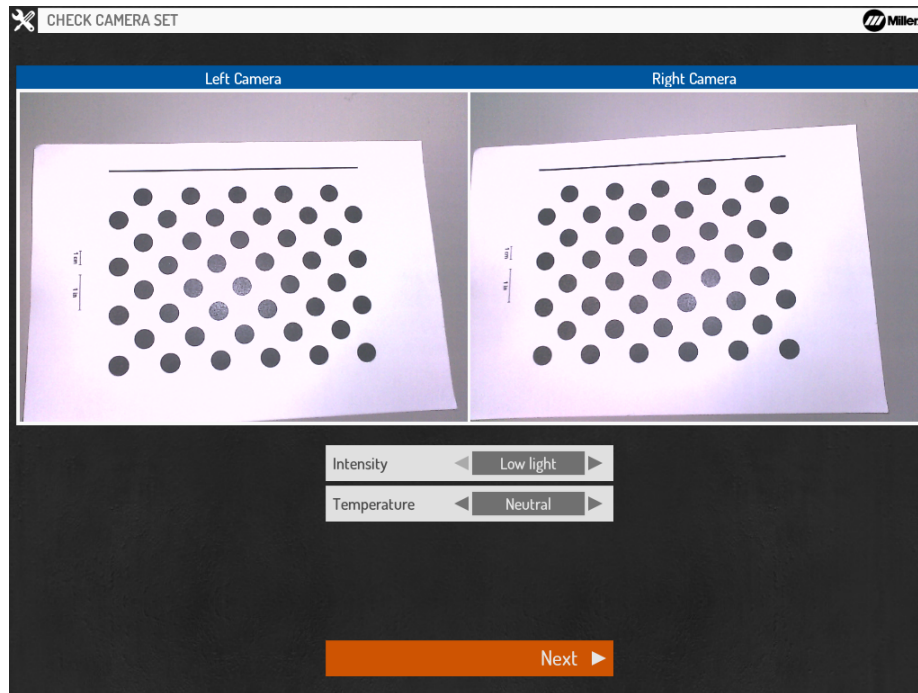



Figure 8-13. Checking Camera Set

2. Auto-Focus Cameras

Locate the camera calibration sheet (supplied with the simulator and also available to print from the AugmentedArc product website). Place it on a flat surface. Hold the helmet over the calibration sheet so that the helmet cameras are facing straight down. Orient the helmet so that the Alignment Guide Reference Line and the Calibration Sheet Reference Line are aligned. Move the helmet closer to or farther from the calibration sheet until the Alignment Guide Border and the Calibration Sheet Border match (note: this should occur when the helmet is about 14 inches away from the calibration sheet).

 *It may be easiest to achieve proper helmet alignment while wearing the helmet and looking at the helmet display.*

 *If printing calibration sheet, verify printed measurements are accurate using a ruler or tape measure.*

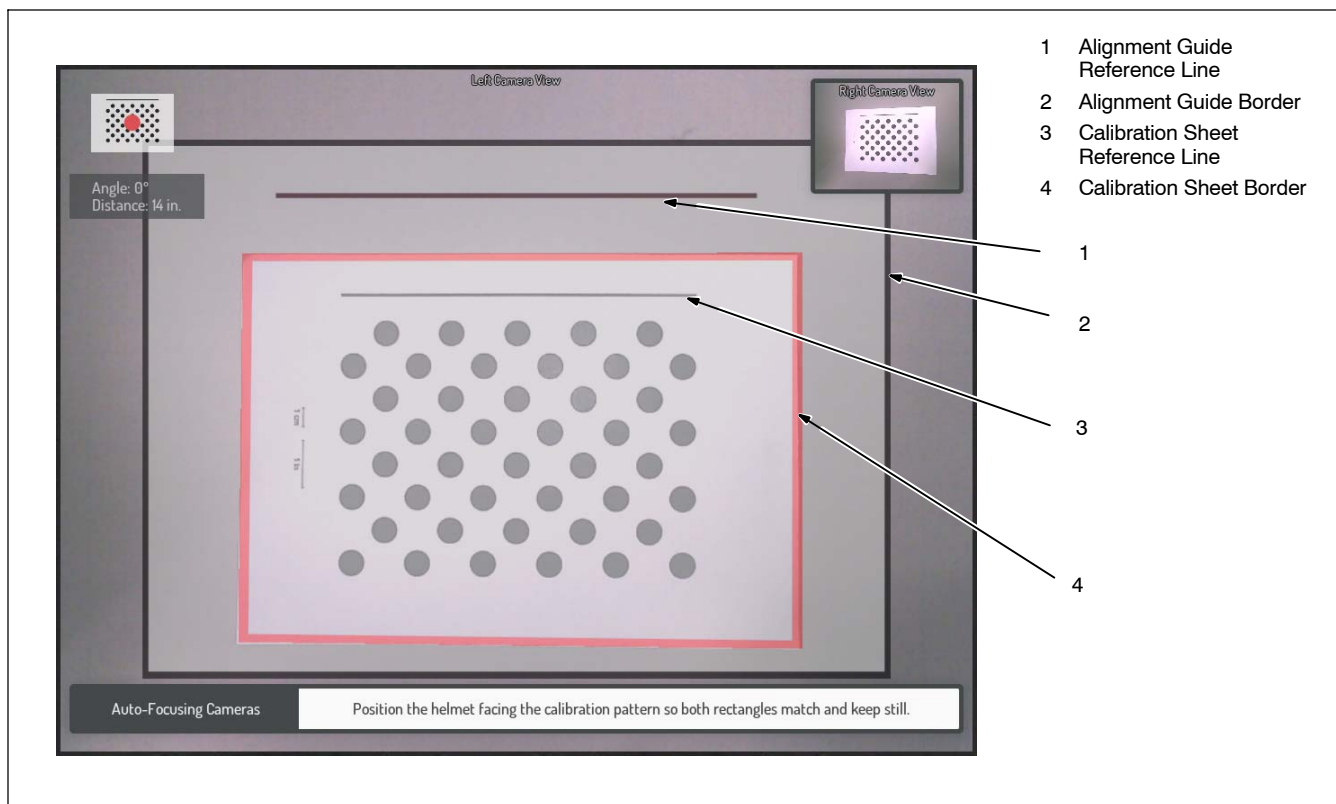


Figure 8-14. Auto-Focus Cameras

When the helmet is positioned properly, the border of the calibration sheet will turn green and a message will appear that says **Hold Position**. Hold the helmet still for a few seconds until the auto-focus process is completed. After completion, it will automatically proceed to the next screen.

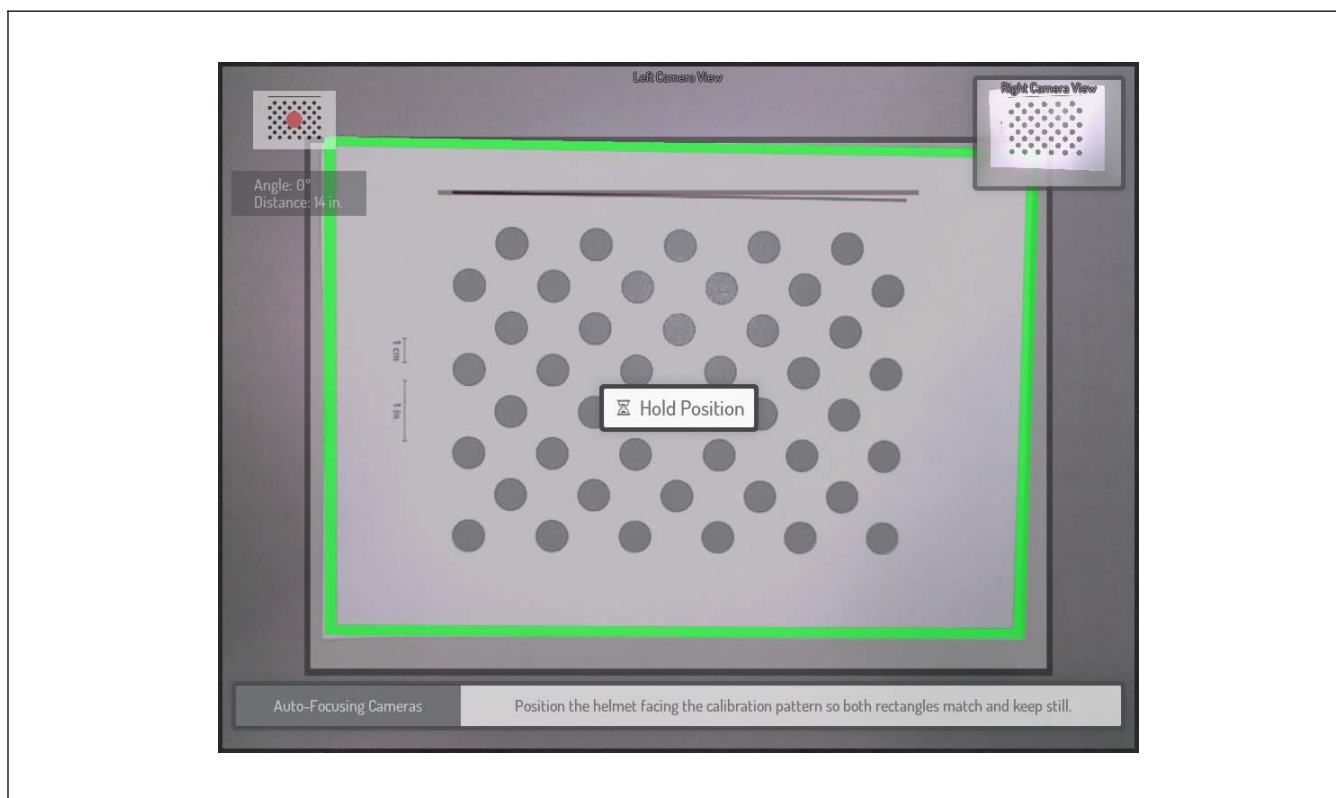


Figure 8-15. Hold Position

3. Confirm Focus

While keeping the helmet in the same position and orientation, the display will show the Left Camera's view of the calibration sheet. Observe the calibration sheet dots. If there is any perceived blur, press **Cancel** and repeat the auto-focus process. If they appear to be in focus (without any significant blur), press **OK** to proceed. On the next screen, repeat the process for the Right Camera.

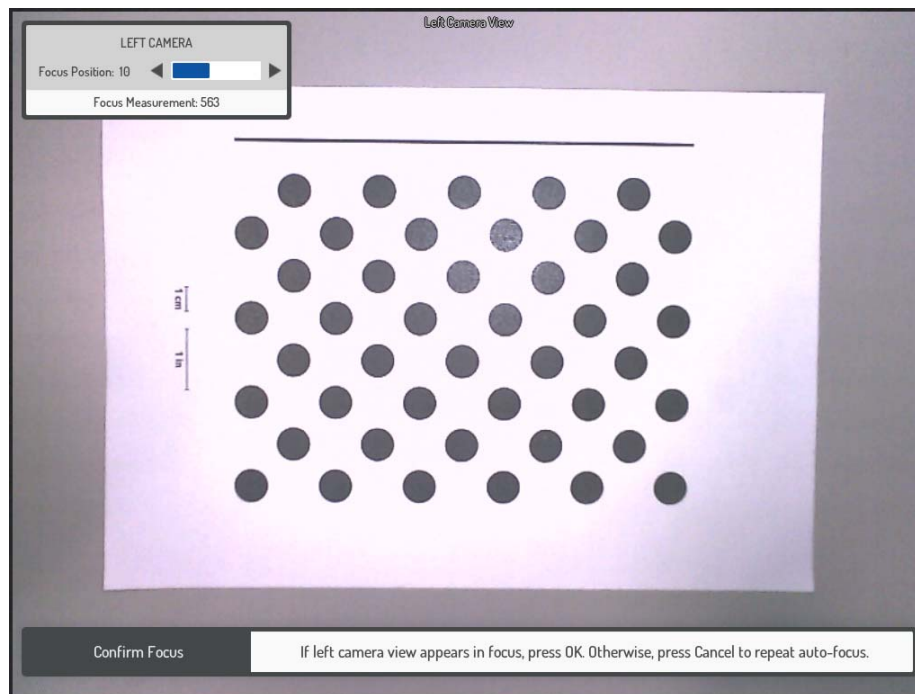


Figure 8-16. Confirming Focus

4. Capture Calibration Samples

To calibrate the helmet, you will be required to capture 8 samples with the helmet facing the calibration sheet at a variety of orientations and distances. For each sample, note the Helmet Position Direction arrow displayed in the upper left corner. Hold the helmet facing the calibration sheet in the indicated direction. Orient the helmet so that the Alignment Guide Reference Line and the Calibration Sheet Reference Line are aligned. Adjust the helmet distance, orientation, and position until the Alignment Guide Border and the Calibration Sheet Border match.

It may be easiest to achieve proper helmet alignment while wearing the helmet and looking at the helmet display.

*If you have trouble aligning them exactly, align them as close as possible and press **OK** to manually trigger the sample capture.*

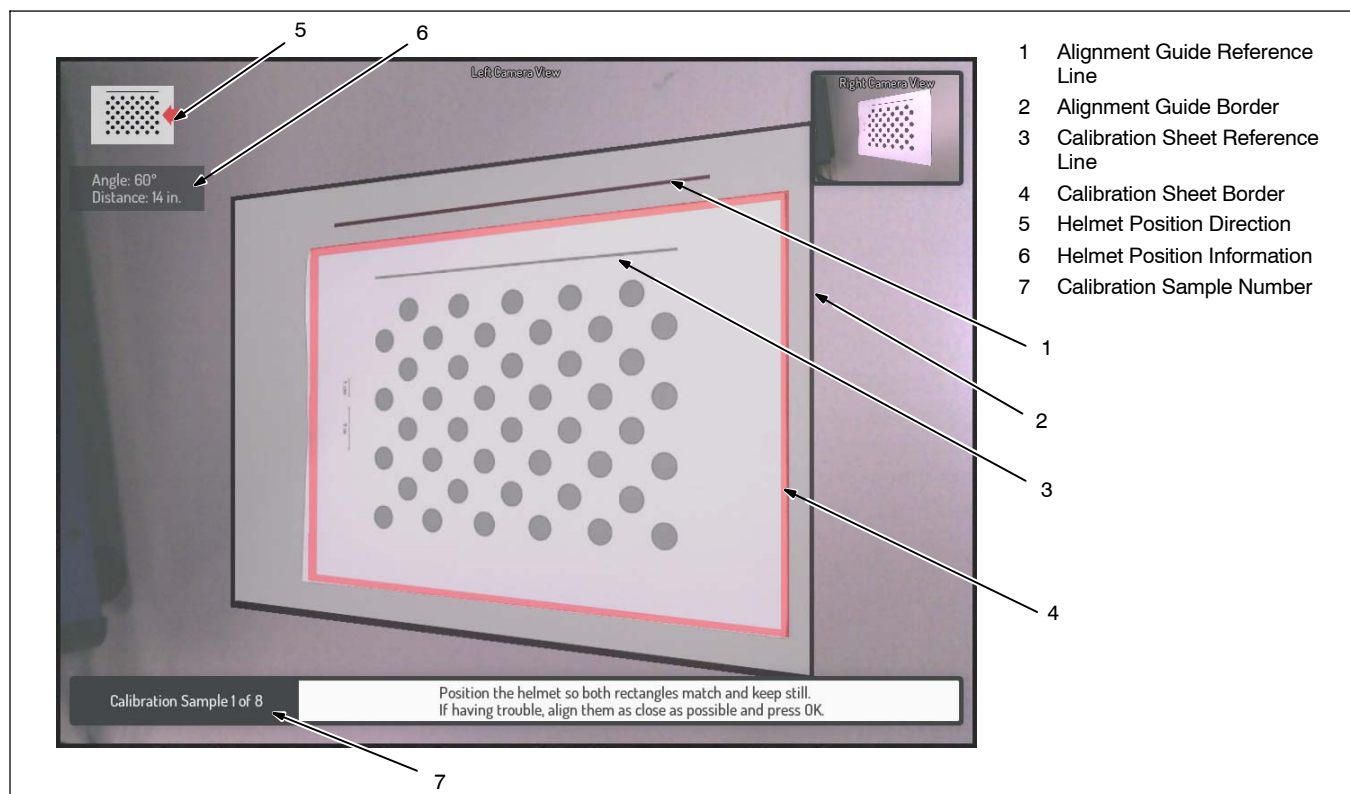


Figure 8-17. Capturing Calibration Samples



Figure 8-18. Helmet In Proper Position For Capturing Calibration Sample 1

When the helmet is positioned properly, the border of the calibration sheet will turn green and a message will appear that says **Hold Position**. Hold the helmet still for a few moments until the calibration sample is captured. After completion, it will automatically proceed to the next sample. For each sample, note the Helmet Position Direction and position the helmet accordingly.

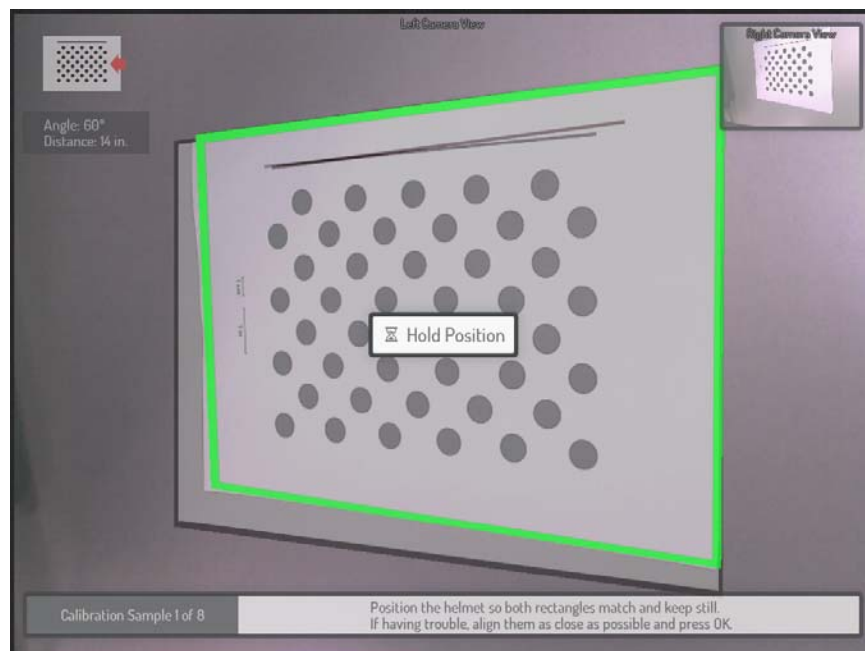



Figure 8-19. Hold Position

After all 8 samples are successfully captured, the results are displayed. If the results indicate a successful calibration, select **Save Calibration**. If the results indicate a failed calibration, this may be due to helmet movement or improper positioning during the capture of one or more of the calibration samples. In this case, select **Start Calibration** to repeat the calibration process.

 If the process of successfully capturing the required samples proves too difficult, there is an option to change the resolution to 640x480 (see Section 8-6A). At this resolution, the calibration process is simpler. However, using this lower resolution setting will not have the tracking benefits of the higher resolution setting.

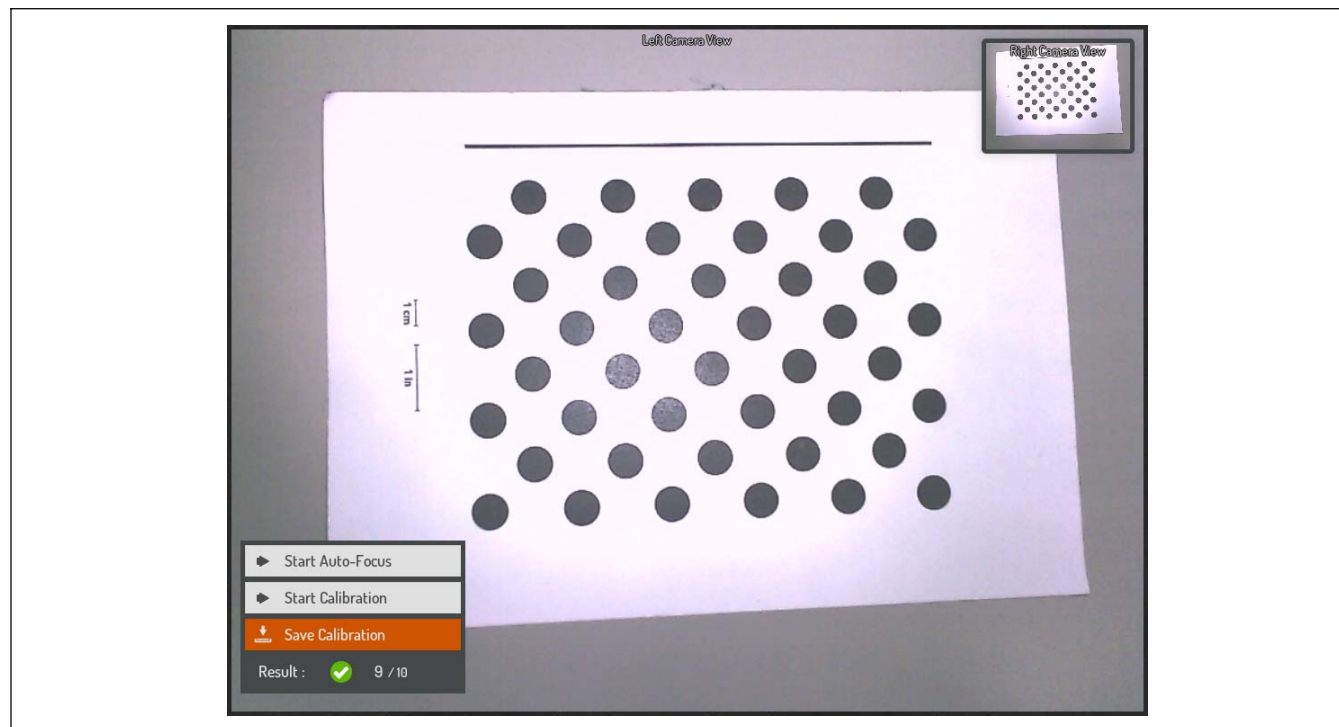


Figure 8-20. Calibration Results

B. Restore Factory Camera Calibration

Selecting **Restore Factory Camera Calibration** will replace the current calibration data with the original data capturing during factory calibration. Do this only as directed by Miller technical support.

8-7. Video Device Settings

The video device settings may need to be adjusted for specific lighting conditions to optimize the AR tracking. To access the Video Settings menu, press the Settings button on the front panel after an exercise has been started.

A. Lighting Calibration

The video settings can be automatically adjusted for the room lighting conditions using the Lighting Calibration feature. This process removes the guesswork from the process and usually results in the settings being optimized for tracking.

To begin the process, select **Start Lighting Calibration Process** and press OK.

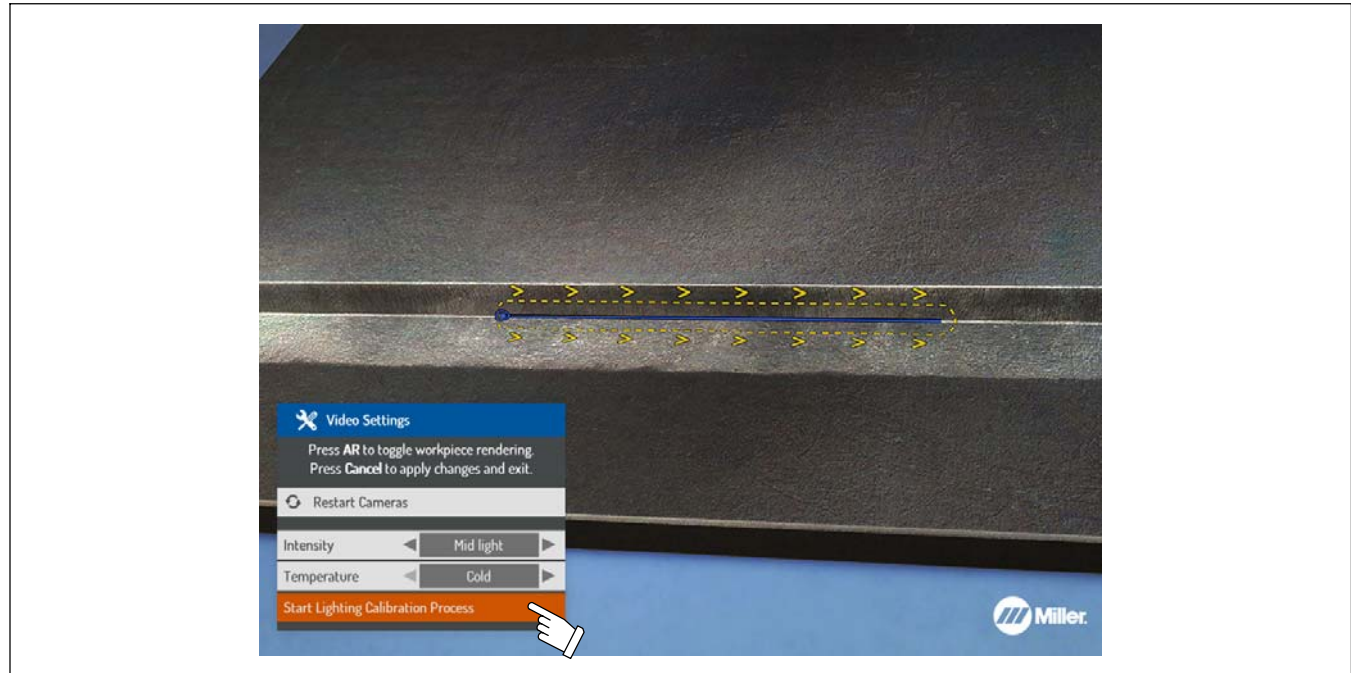


Figure 8-21. Video Device Lighting Calibration

When prompted, select Yes and follow the on-screen instructions (see Section 7-2C).

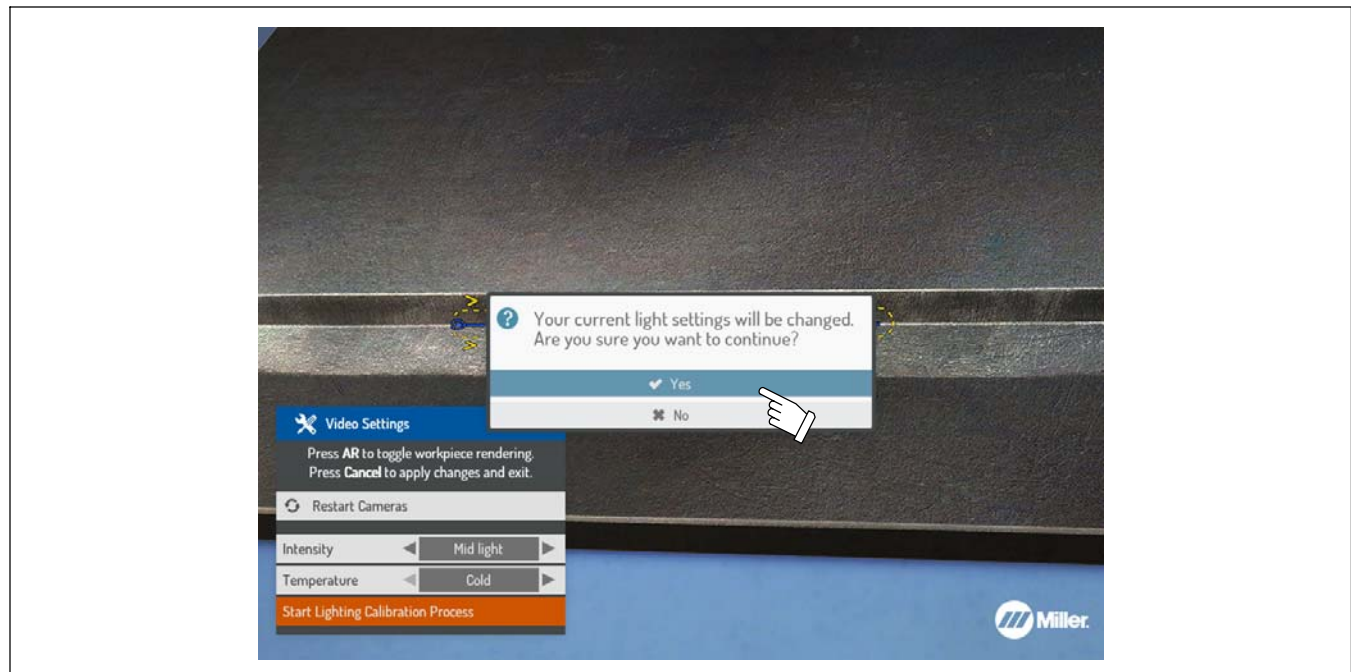


Figure 8-22. Lighting Calibration Confirmation Prompt

B. Temperature Setting (Figure 8-23)

Use the up/down Navigation buttons to select the **Temperature** setting. Use the left/right Navigation buttons to select either **Cold**, **Neutral**, or **Warm**. Choose the setting that corresponds to the color of light in the room (cold = bluish, neutral = white, warm = yellow). If the Lighting Calibration process fails to result in the best settings, they can be adjusted manually.

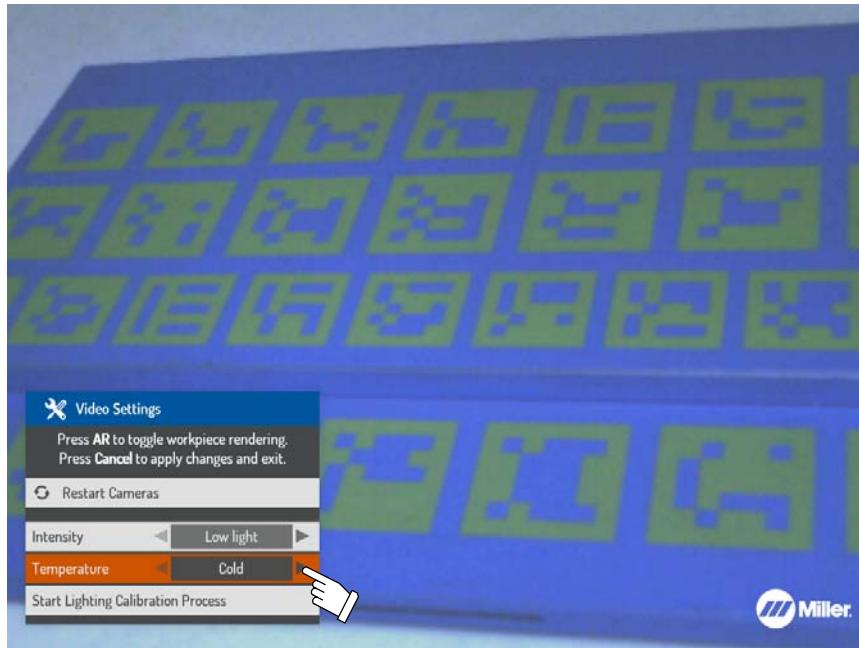


Figure 8-23. Changing Temperature Setting

C. Intensity Setting (Figure 8-24)

Use the up/down Navigation buttons to select the **Intensity** setting. Use the left/right Navigation buttons to select either **Low Light**, **Mid Light**, or **High Light**. Choose the setting that corresponds to the intensity of light in the room.

If AR tracking is working properly, select **Cancel** to apply the changes and exit.

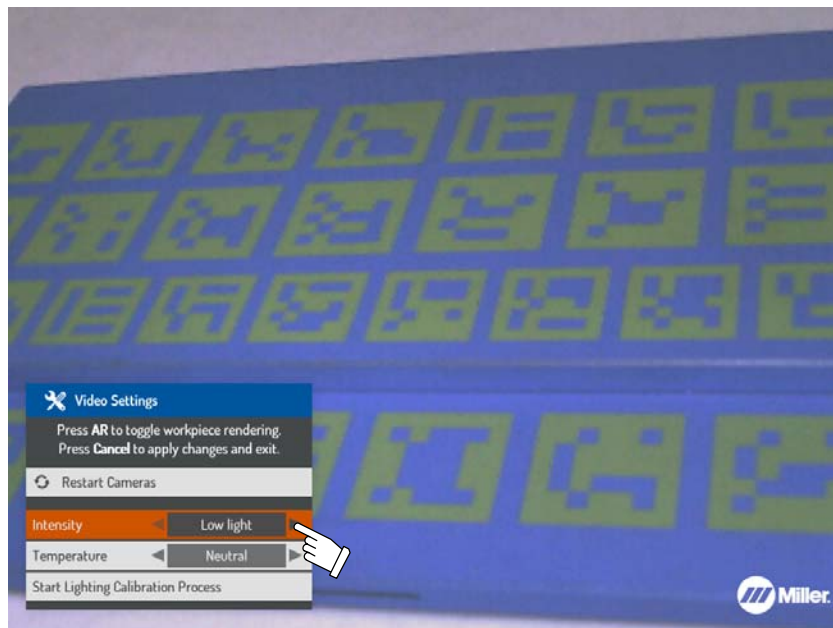


Figure 8-24. Changing Intensity Setting

D. Custom Settings

If the existing options for lighting intensity and temperature do not resolve AR tracking issues, custom settings can be created.

To create a custom Light Intensity setting, use the up/down arrows to select the light intensity setting, and press OK (Figure 8-25). Use the up/down Navigation buttons to scroll to a light intensity setting (Exposure, Gamma, Brightness, etc.), and then use the left/right Navigation buttons to adjust. After the desired light intensity values are set, select **Save as custom** and press OK, or press Cancel to exit the menu. Choose the name of the custom setting (Custom 1, Custom 2, Custom 3) to save the current intensity values.

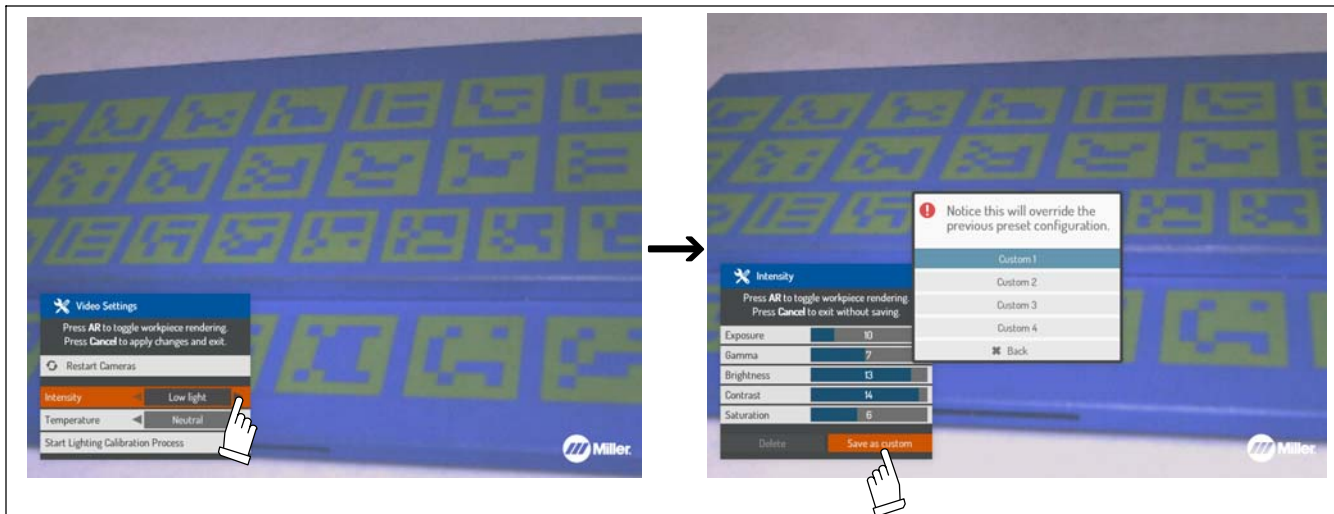


Figure 8-25. Creating Custom Light Intensity Setting

To create a custom Light Temperature setting, use the up/down arrows to select the temperature setting, and press OK (Figure 8-26). Use the left/right Navigation buttons to adjust the Hue value. After the desired hue value is set, select **Save as custom** and press OK, or press Cancel to exit the menu. Choose the name of the custom setting (Custom 1, Custom 2, Custom 3) to save the current temperature value.

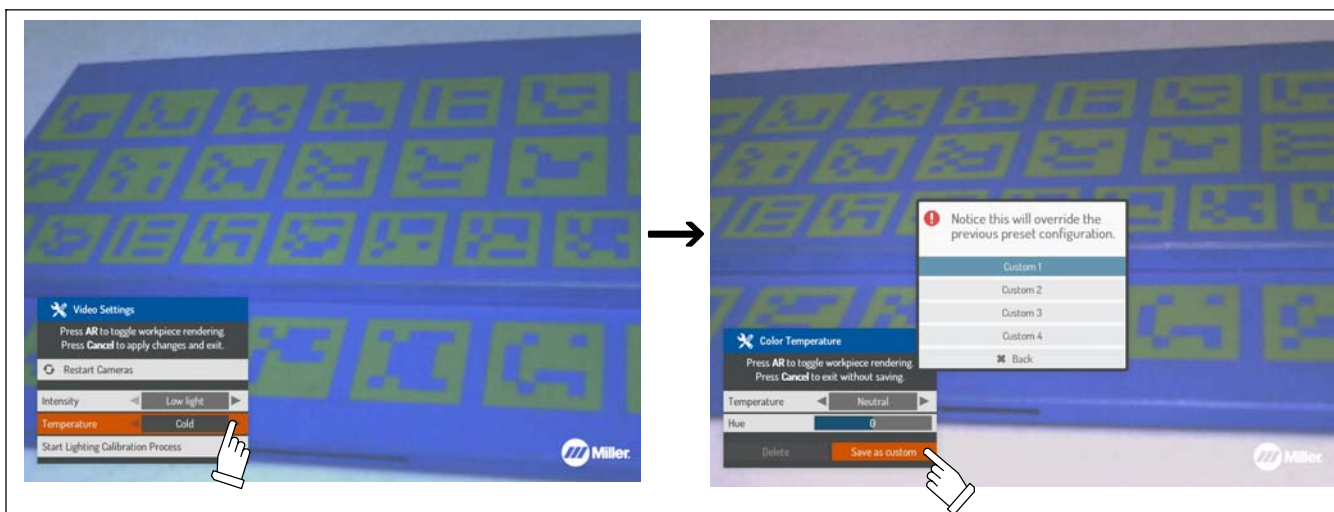


Figure 8-26. Creating Custom Light Temperature Setting

To apply a custom intensity or temperature setting, use the up/down and left/right Navigation buttons to scroll to the desired custom option for each setting and then press **Cancel** to apply the changes and exit (Figure 8-27).

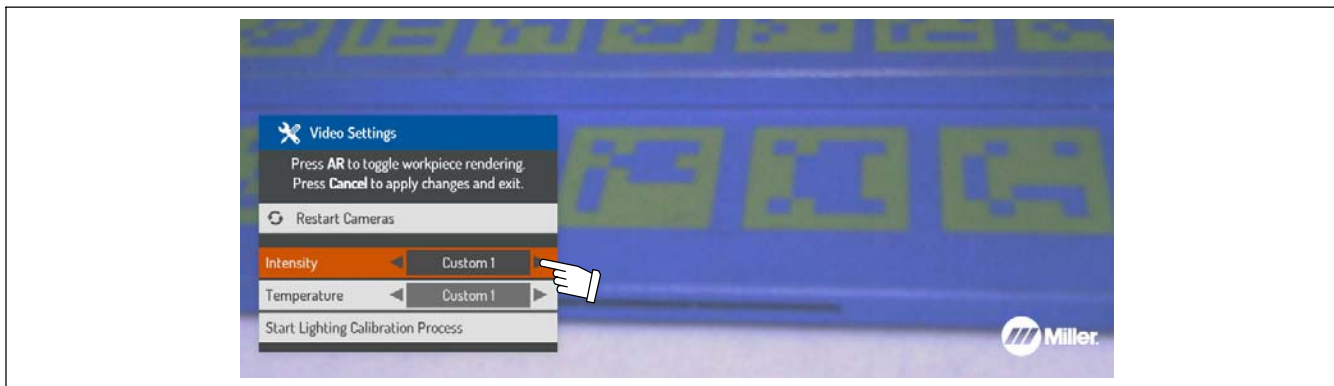


Figure 8-27. Applying Custom Settings

SECTION 9 – USING THE TEACHER SOFTWARE

9-1. Installing The Teacher Software Program

Download the teacher software from the Miller website at <https://www.millerwelds.com/aasoftware>

Computer requirements:

- Windows Vista, Windows 7, Windows 8, Windows 10
- Processor 32 bits (x86) 2.2GHz 3MB
- RAM 2GB
- Graphic 512MB DirectX 9.0c compatible
- NVidia GeForce GT440 or higher
- ATI Radeon HD5000 or higher
- HDD 250MB

Installation Procedure

Double-click the Install.exe file. The Installation window appears (Figure 9-1). Click **Next**.

Continue with the installation process, including the license agreement screen. A Teacher Software shortcut and a shortcut on the Windows taskbar will be created (Figure 9-2). Click **Finish**.

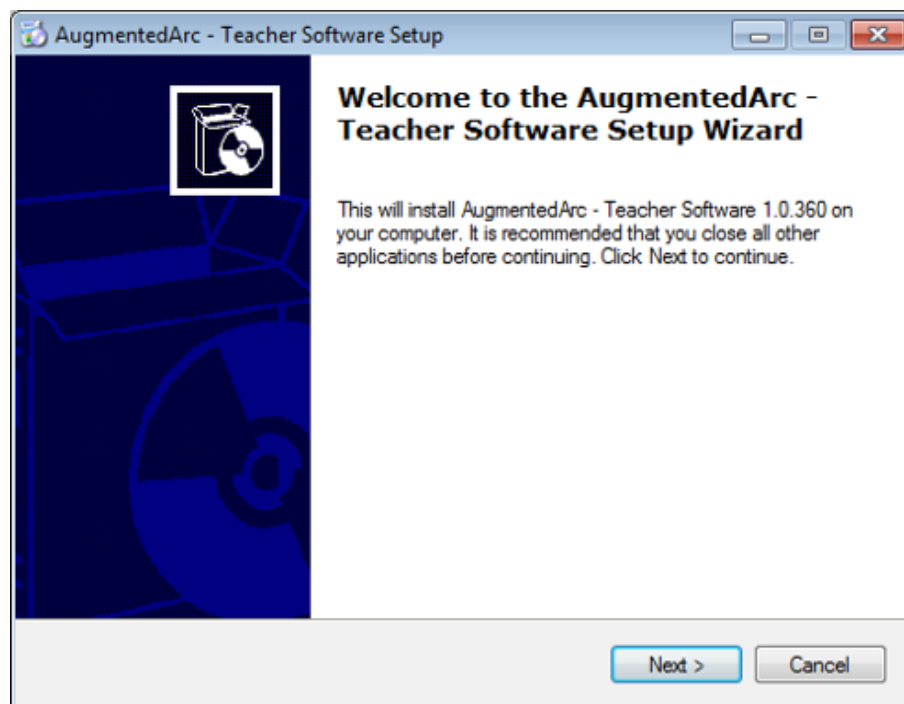


Figure 9-1. Teacher Software Installation Screens

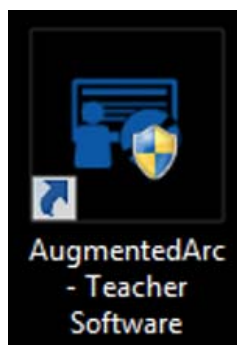


Figure 9-2. Teacher Software Shortcut Icon

Connect the computer running the Teacher Software to the AUGMENTED-ARC network (Figure 9-3).

 Be sure the computer is connected to the AUGMENTED-ARC network before opening the Teacher Software.

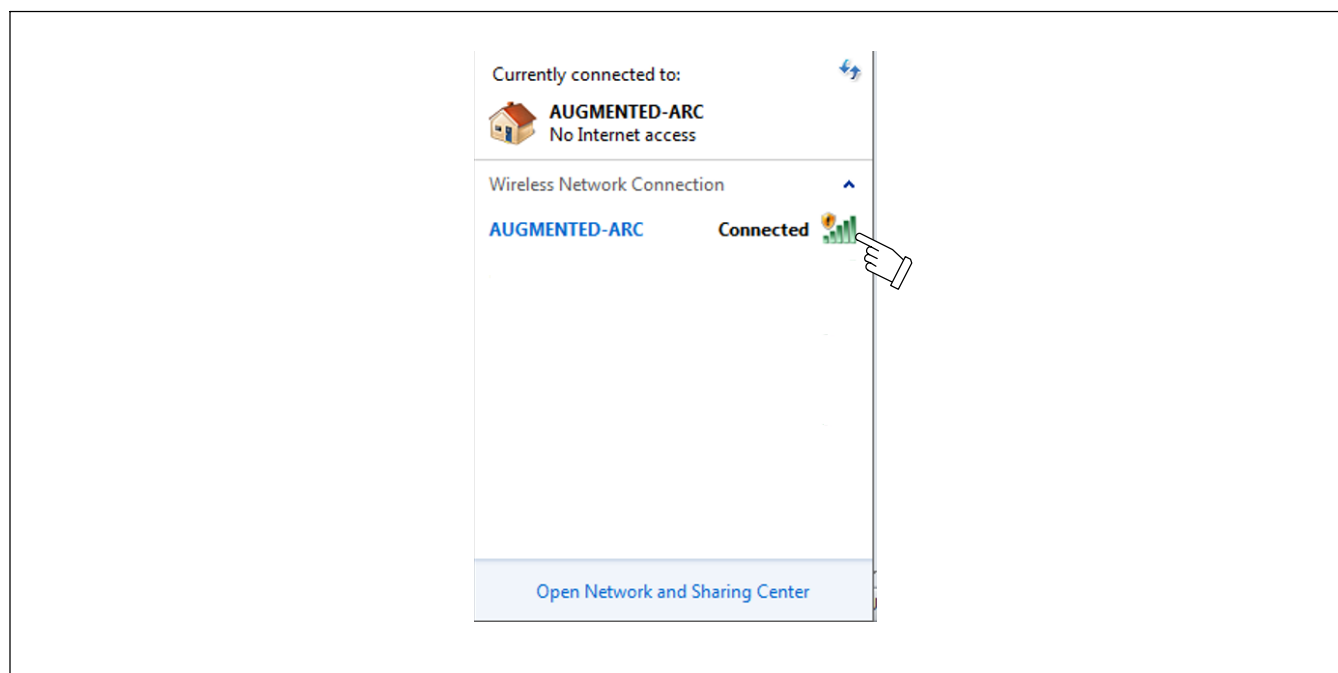


Figure 9-3. AUGMENTED-ARC Network Connection

Open Teacher Software on computer. The IP Address login screen appears (Figure 9-4).

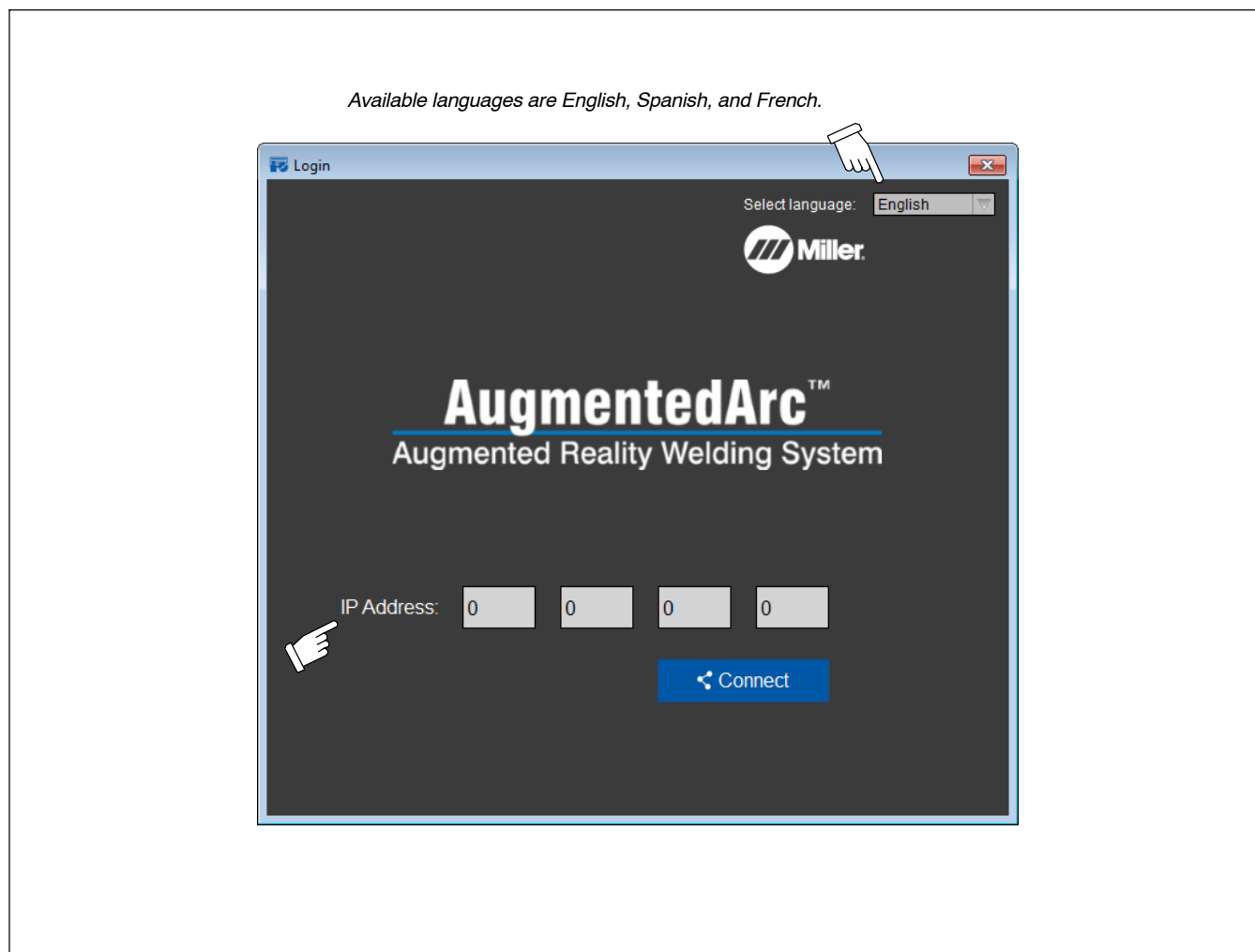


Figure 9-4. IP Address Login Screen

For classroom configurations the IP address is always the same (10.0.0.1). To obtain the IP Address for stand-alone configurations, log in as administrator on AugmentedArc system. Press AugmentedArc Systems Settings Button (Section 6-1). System Settings screen displays Ethernet IP address (Figure 9-5).

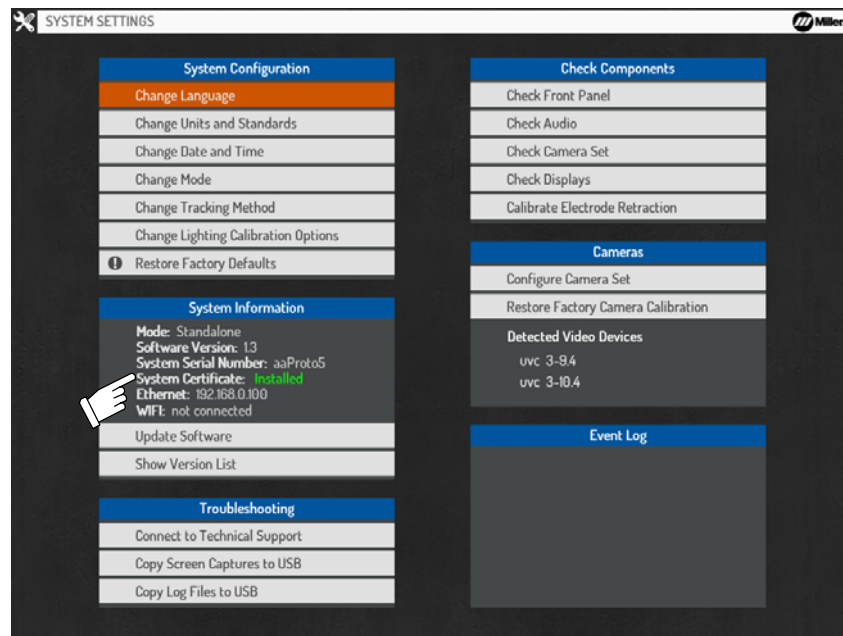


Figure 9-5. System Settings Screen

Enter Ethernet IP address on the teacher login screen (Figure 9-6). Click **Connect**. The user/password login screen appears (Figure 9-7). Enter user name (teacher) and password (augmentedarc). Click **Login**.

*For stand-alone configurations, enter the Ethernet IP address shown on the simulator screen.
For classroom configurations the IP address is always the same (10.0.0.1).*

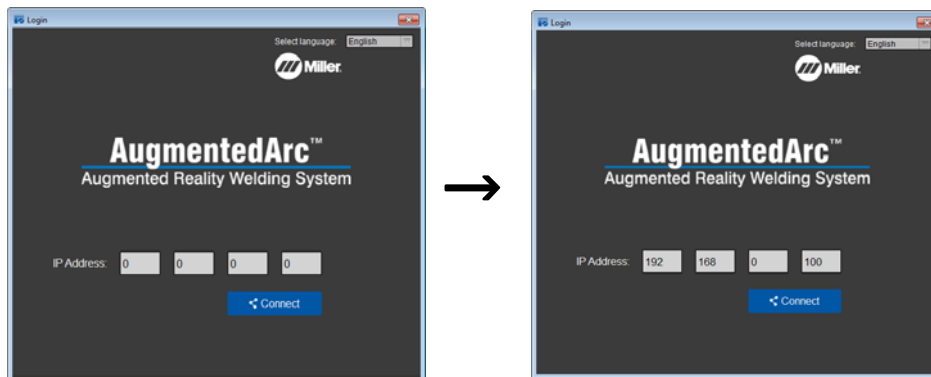


Figure 9-6. Ethernet IP Address Login Screen (Teacher Software)

User name is teacher and Password is augmentedarc.

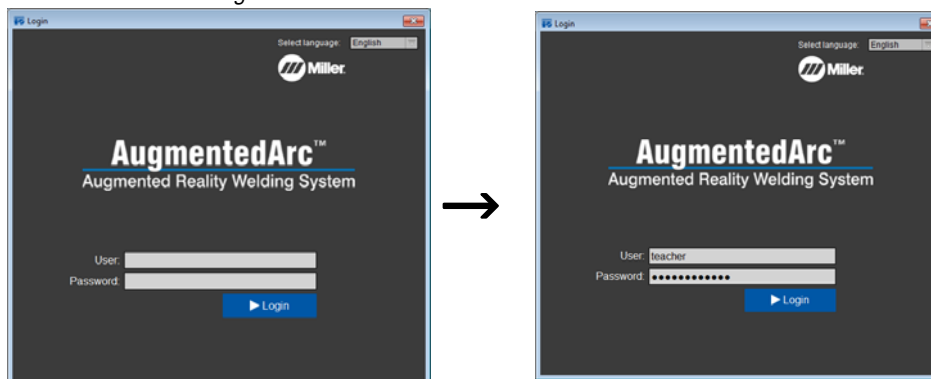


Figure 9-7. User/Password Login Screen (Teacher Software)

An error message is displayed after five seconds if the connection fails (Figure 9-8). The error may be caused by the following issues:

- Incorrect IP address. For Standalone mode, check the IP address on the AugmentedArc (see Figure 9-5) and reenter it. For Classroom mode, enter 10.0.0.1.
- Failure to connect to the AugmentedArc Network. Repeat the installation steps; verify the router and simulator are properly connected.
- Teacher software was started before the computer fully established a connection to the Augmented-Arc network. Exit the Teacher Software and restart it.

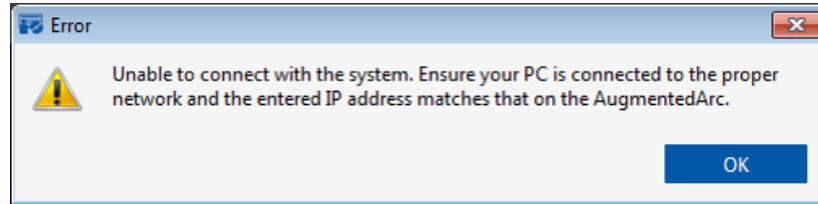


Figure 9-8. Connection Error

9-2. Using The Teacher Software

The navigation header contains options to select between the **Course**, **Students**, **Modules**, and **Virtual Classroom** sections of the software.

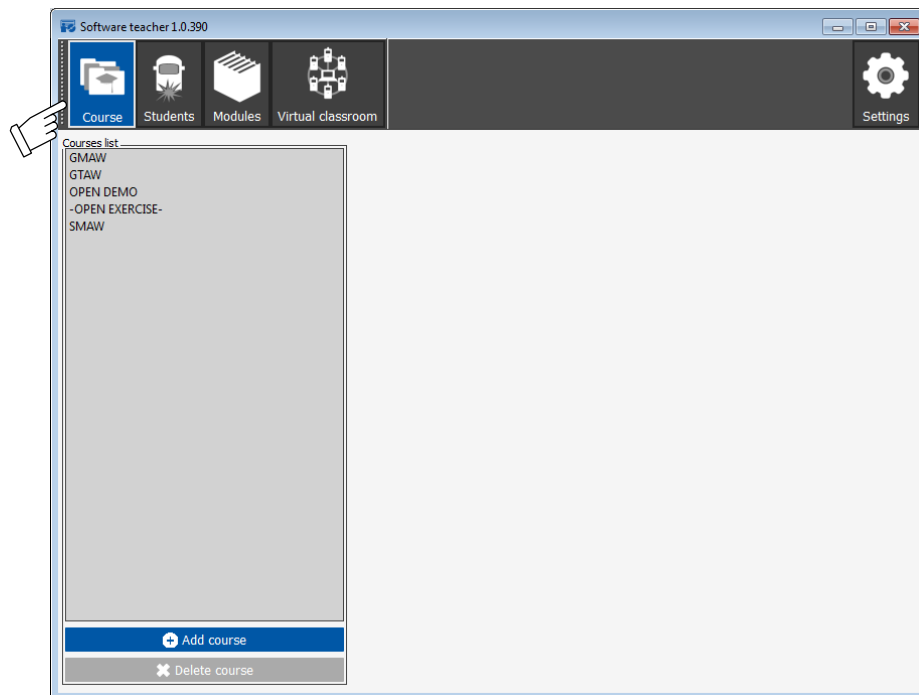


Figure 9-9. Teacher Software Navigation Header

A. Student Home Page (Figure 9-10)

A list of existing students is displayed on the left side of the screen. Select <--> symbol in the Select Course field (over the students list) to display all of the enrolled students. Select a course to see a list of students assigned only to that course; select a student to see the student's profile.

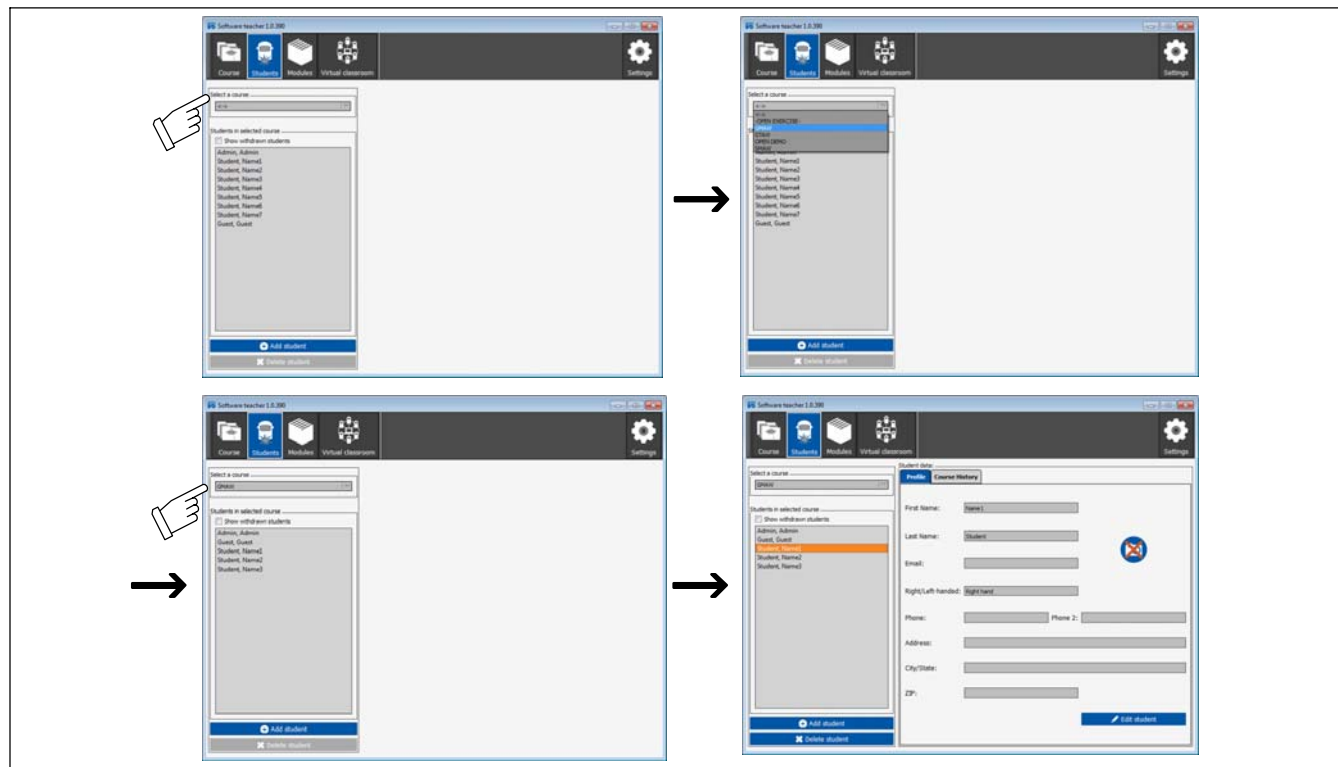


Figure 9-10. Student Home Page

B. Adding A Student (Figure 9-11)

Click **Add Student** and the student data screen is displayed. The Name and Password fields are mandatory, but the remaining fields are optional. (Only numerals 1 – 4 can be used for Password.) Assign a picture to a student by clicking **Add image** and then selecting the desired photo to be added to the student personal file. Click **Submit** to save changes.

 The student image must be in a .png format, and the file size cannot exceed 2Mb.

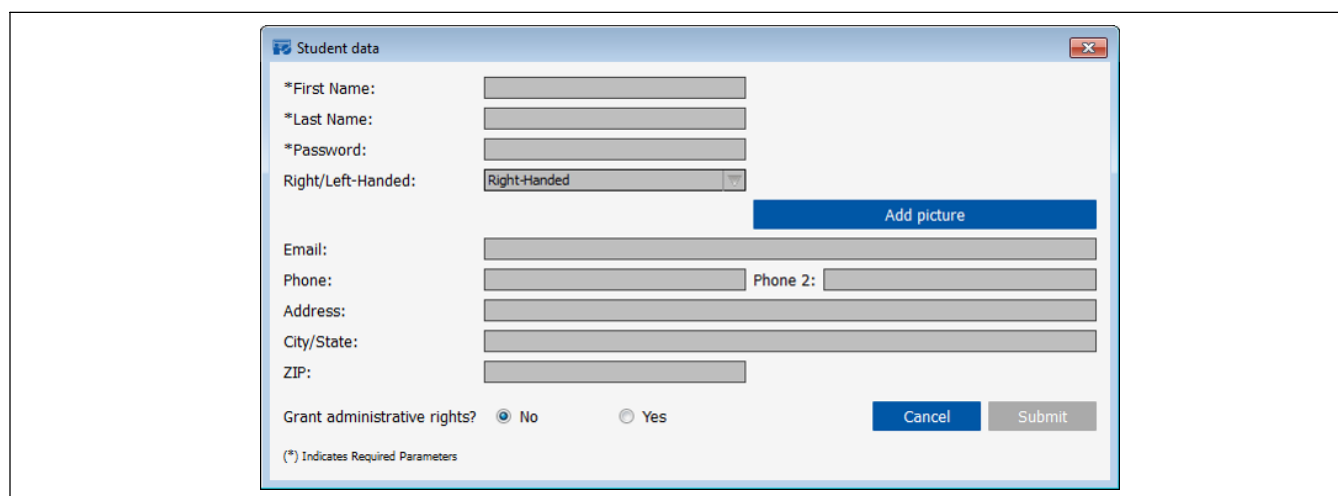


Figure 9-11. Student Data Screen

C. Editing Student Information

Select the student whose information will be edited and click **Edit Student**. The student data screen is displayed: Edit the data fields as desired. Click **Submit** to save changes.

D. Deleting A Student (Figure 9-12)

Select the student to be deleted and click **Delete Student**. There are two options to delete a student:

- Delete Permanently: Student will be completely deleted.
- Withdraw Selected Student: All information will be saved but it will not be shown in the courses.

To see inactive students in a course check the Show Withdrawn Students box. Inactive students will be shown in red. Click **Add Student** to activate a student. The student's name will again appear in the courses.

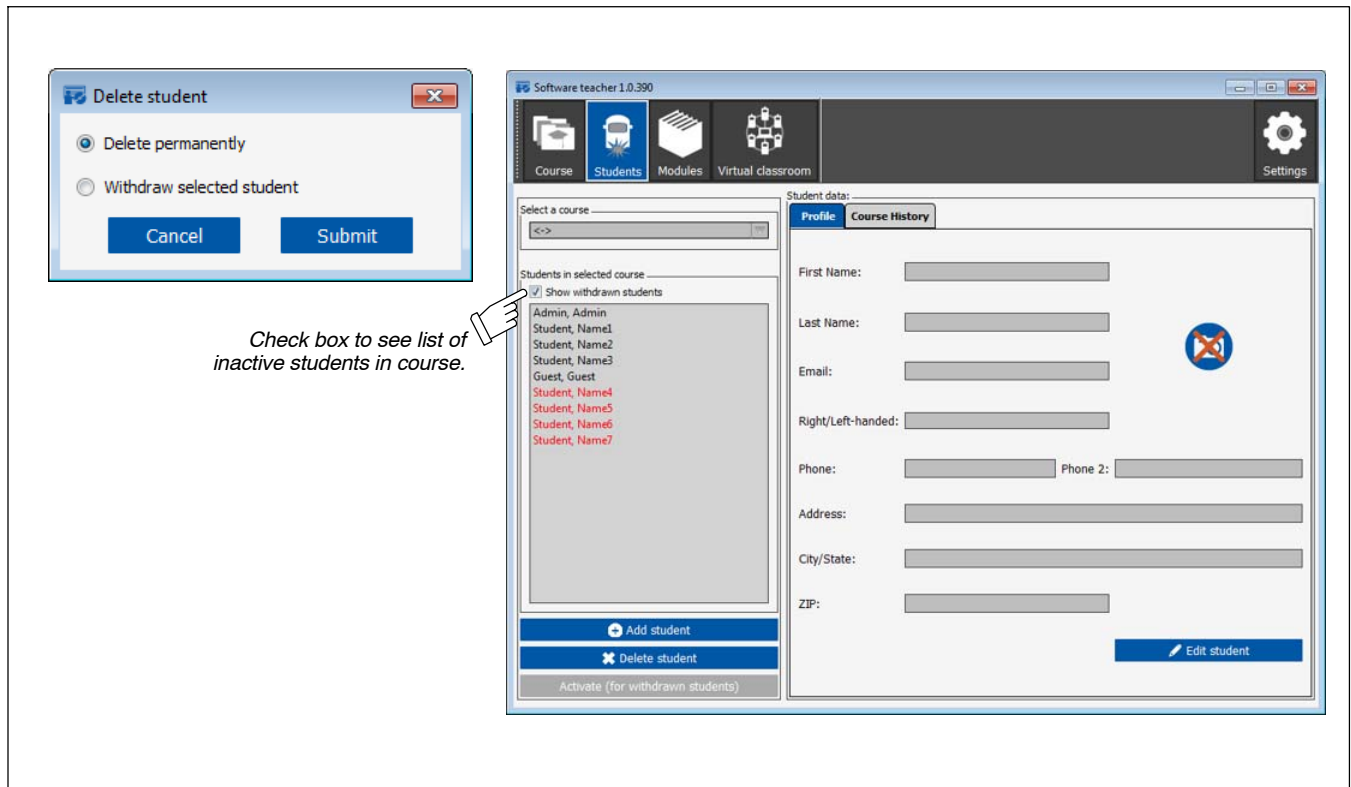


Figure 9-12. Delete Student And Inactive Student Screens

9-3. Module Management

The left side of the screen displays existing modules. Except for predefined module content, modules can be added, edited, or deleted. The right side of the screen displays module descriptions and tasks. Select an existing module to access its information.

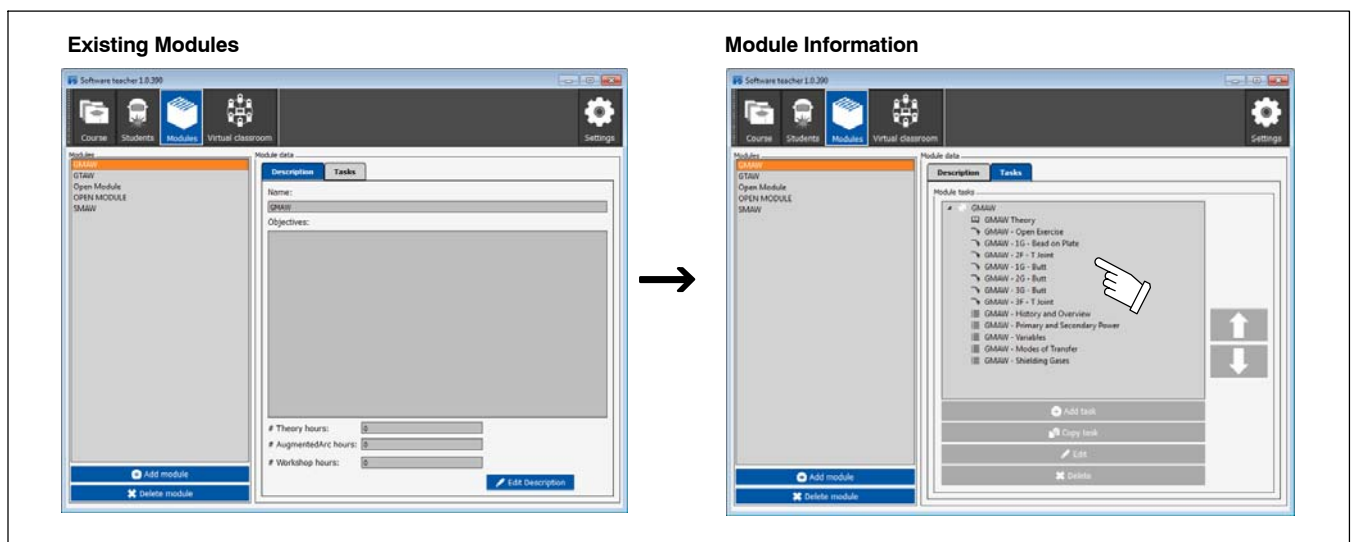


Figure 9-13. Module Screen

A. Task Information

The task screen displays all the instructional units and exercises that a particular module includes. The relationship between courses, modules, and units is displayed in Figure 9-14.

- A course is composed of one or more modules.
- Each module is composed of the required units.
- The tasks (theory, exercises, and quizzes) are included in the units.

The first step is to select a module into which content will be added. Tasks (theory, exercises, or quizzes) can also be copied to the existing modules within the Teacher Software to make it easier for the teacher to create courses. This option will appear when a module is selected.

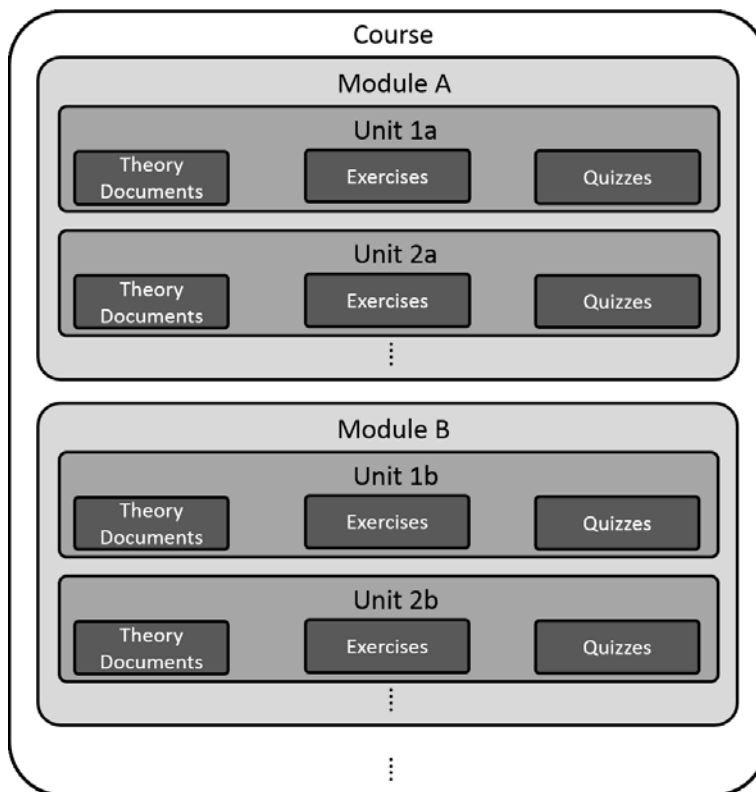


Figure 9-14. Course Structure

B. Adding A Task (Figure 9-15 And Figure 9-16)

Click **Add Task**. The Activities screen appears.

Select the type of task to be added and indicate if an existing unit will be used or a new unit created. If the module is empty, a new unit must be added. To add a unit, enter unit name and click **Submit** to begin adding the tasks. Add tasks as follows:

- To add a new task in a particular unit, select an activity and click **Add Task**.
- To add a new task to a current unit, select an activity and the task will be added at the end of the unit.

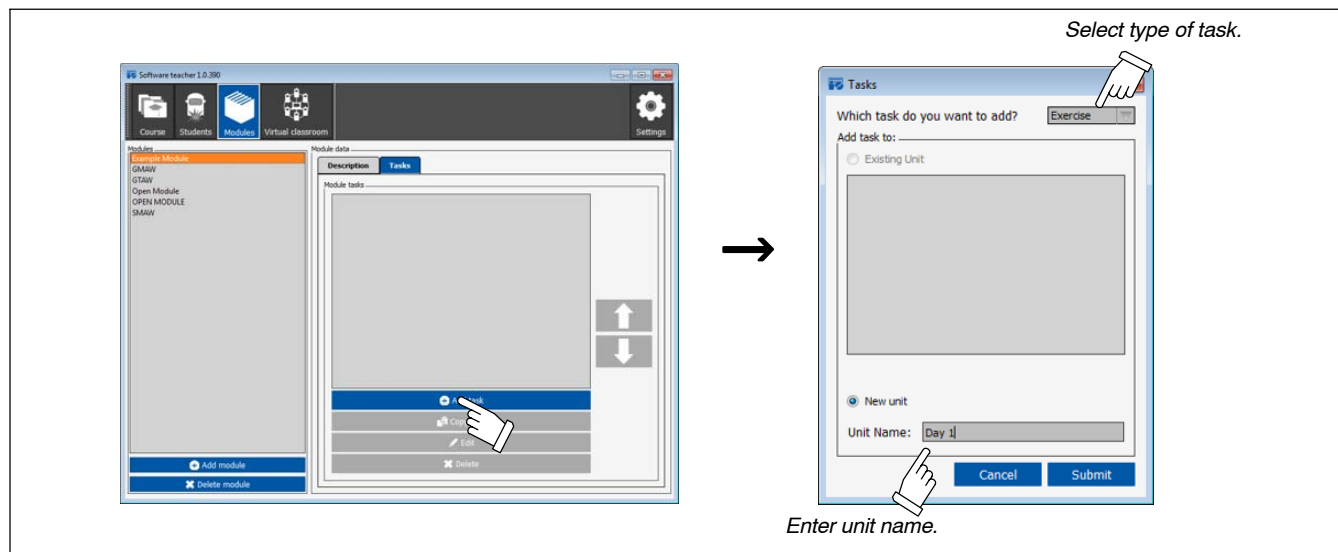


Figure 9-15. Task Screens

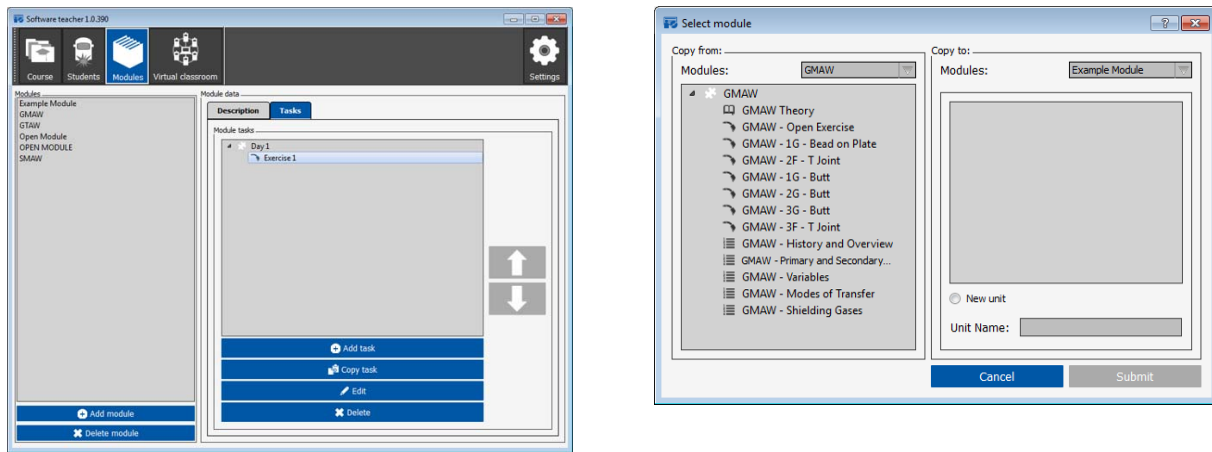


Figure 9-16. Task Screens

Theory

To add a new Theory, select **Theory** in the task field. Browse to and select the file to upload, and enter name and objective:

- Name – The name you want to use for the file.
- Objectives – Objectives the theory is designed for.

Click **Select File** to browse for a file on the PC. Only PDF files can be uploaded.

Enter data in all the fields and select the file before clicking the **Submit** button. Click **Submit** and a window will appear indicating that the file is being converted and uploaded to the controller. This process may take several minutes, depending on the size of the selected file. **Maximum file size is 20 Mb.**

Remember, the theory file cannot be viewed in the Teacher Software.

Welding Exercise

Select the Exercise option in the task field to add a new exercise.

Click **Submit** and a new screen will display all the parameters of the exercise.

Quiz (Figure 9-17)

Select the Quiz option in the task field to add a new quiz.

Click **Add Quiz** and a new screen will display all the parameters of the test. All fields are mandatory. Click **Submit**.

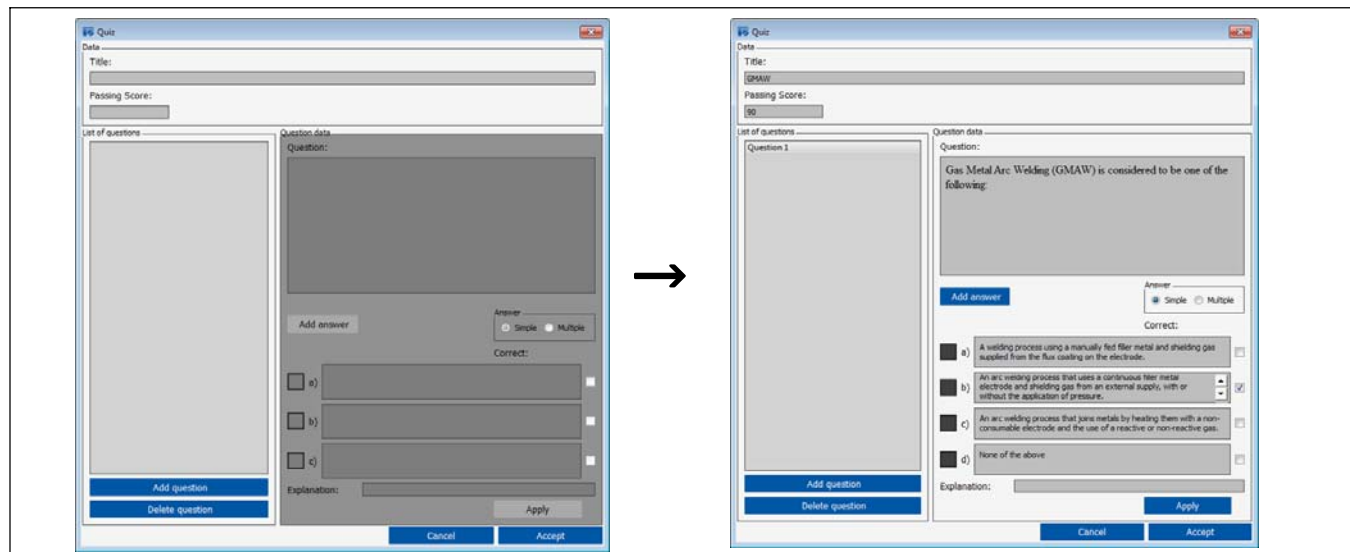


Figure 9-17. Adding A Quiz Screen

A maximum of 25 questions may be added. Select a question to update it with new information. Edit an existing question or write the new question in the Question field. The following options exist for the answers:

- Add one more option for possible answers (maximum 6).
- Choose if the question has just one (simple) or several (multiple) valid answers.
- Delete options as answers.
- Choose the correct answers. If you have not chosen at least one valid answer, a message is displayed indicating that the correct answer has not been selected.

Click **Apply** to save the changes.

If you choose another answer without saving the changes, the system will detect it and display a message indicating that the configuration will be lost. After all of the test questions have been created, click **Submit** to save the test.

C. Edit And Delete A Task

Select the task to be edited and click **Edit**. The Add A Task window opens. Edit the fields as necessary. Click **Submit** to save the changes.

To delete a task, select the corresponding module and the task to be deleted. Click **Delete Task** and a confirmation window displays. Click **OK** or **Cancel**.

D. Designing The Welding Exercise (Figure 9-18)

Click **Add Exercise**. The Add Exercise Screen is displayed.

This screen gives you the option of adding a WPS file to familiarize students with this type of documentation. The WPS will be viewed in the simulator before starting the welding exercise.

There are 4 difficulty levels:

- Beginner
- Intermediate
- Advanced
- Open – Student selects level of difficulty.

Figure 9-18. Add Exercise Screen

The teacher can also designate the number of times the welding exercise can be attempted. When all the mandatory fields are filled, proceed to the next screen. This screen allows you to select the parameters you want the AugmentedArc to evaluate for the exercise, and also the real time guide parameters you want the system to display during the exercise. You can select or deselect all the parameters by checking the **Enable/Disable All** option. Click **Next** to continue selecting the exercise parameters.

The teacher can also set the passing score and whether the student can continue with incorrect equipment settings.

Figure 9-19. Exercise Parameter Screens

Exercise parameters include the following:

Procedure

- Welding process – SMAW, GMAW, FCAW (gas and self-shielded) and GTAW
- Tungsten electrode (only for GTAW)
- Activate electrode stick consumption: If selected, the electrode will be consumed (consumption rate is dependent on the welding parameters and student performance).
- Joint Type
- Base material
- Position
- Thickness
- Weld type

Click **Next** and continue with additional parameter configuration options:

- Filler classification
- Type
- Diameter
- Gas composition

After the parameters are configured, continue to the last window to view the welding procedure values. Click **Edit** to customize the procedure values. The Add Exercise screen is displayed (Figure 9-20).

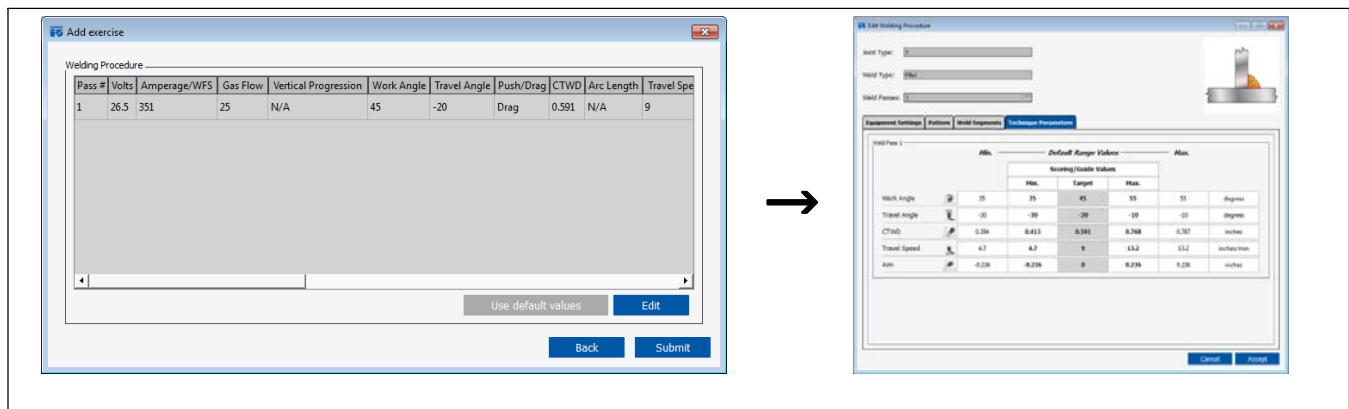


Figure 9-20. Add Exercise Screens

An image of the joint you are going to weld (and the passes chosen) will appear in the upper right corner of the screen. Assign the desired values to the different parameters. The range of tolerance will be higher or lower depending on the level of difficulty chosen for the exercise.

When all parameters have been configured, click **Submit**. The table will be filled with the corresponding data.

E. Scoring

The AugmentedArc system provides three difficulty levels: beginner, intermediate, and advanced. The parameter tolerances for each level are as follows:

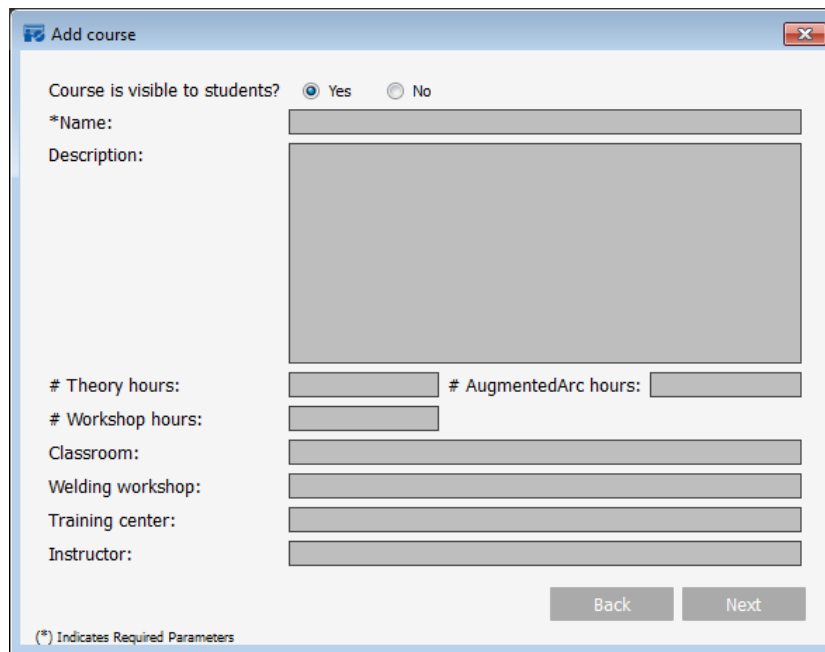
	Beginner	Intermediate	Advanced
V (volts)	± 2	± 1.5	± 1
A (amps)	± 20	± 15	± 10
WFS (inches/min)	± 20	± 15	± 10
Gas (cubic feet/hour)	± 10	± 7	± 5
Work Angle (deg)	± 15	± 10	± 5
Travel Angle (deg)	± 15	± 10	± 5
CTWD (inches)	± 0.25	± 0.175	± 0.10
Arc Length (inches)	± 0.20	± 0.15	± 0.10
Travel Speed (inches/min)	± 6	± 4	± 2
Aim (inches)	± 0.25	± 0.20	± 0.15
Rod Work Angle (deg)	± 20	± 15	± 10
Rod Travel Angle (deg)	± 25	± 20	± 15

By default, all Real-Time Guides are enabled. The Real-Time Guides can be individually configured when developing a customer exercise using the Teacher Software.

9-4. Course Management

A. Adding Courses

Click **Add Course**. The Add Course screen is displayed. You must enter data in the **Name** field. The remaining fields are optional. If the **Course Visible** option is enabled, the selected course will appear in the simulator. After completing the data fields, click **Next**.

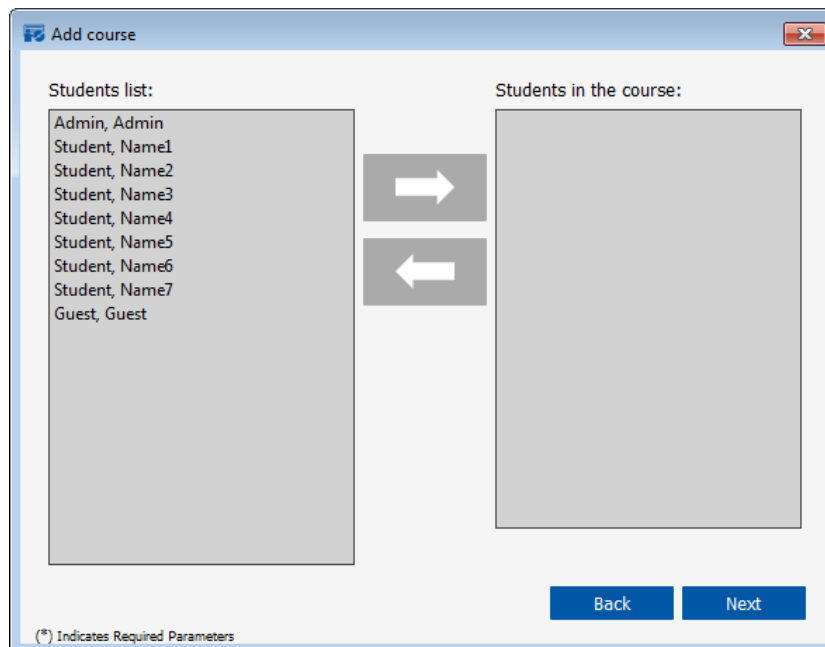


The "Add course" window contains the following fields and controls:

- Course is visible to students? ☒ Yes ☐ No
- *Name: [Text input field]
- Description: [Large text area]
- # Theory hours: [Text input field]
- # AugmentedArc hours: [Text input field]
- # Workshop hours: [Text input field]
- Classroom: [Text input field]
- Welding workshop: [Text input field]
- Training center: [Text input field]
- Instructor: [Text input field]
- Back [Button]
- Next [Button]
- (*) Indicates Required Parameters

Figure 9-21. Add Course Screen

The student roster for the course is displayed. Select a student on the left panel and click the right arrow to add that student to the course. To remove a student, select the student on the right and click the left arrow. After all desired students are added, click **Next**.



The "Add course" window displays the student roster management interface:

- Students list: [List box containing Admin, Admin; Student, Name1; Student, Name2; Student, Name3; Student, Name4; Student, Name5; Student, Name6; Student, Name7; Guest, Guest]
- Students in the course: [Empty list box]
- [Right arrow button]
- [Left arrow button]
- Back [Button]
- Next [Button]
- (*) Indicates Required Parameters

Figure 9-22. Adding Students To A Course

The modules of the course are displayed. Select a module on the left panel and click the right arrow to add that module to the course. To remove a module, select the module on the right panel and click the left arrow. After all desired modules are added, click **Accept**.

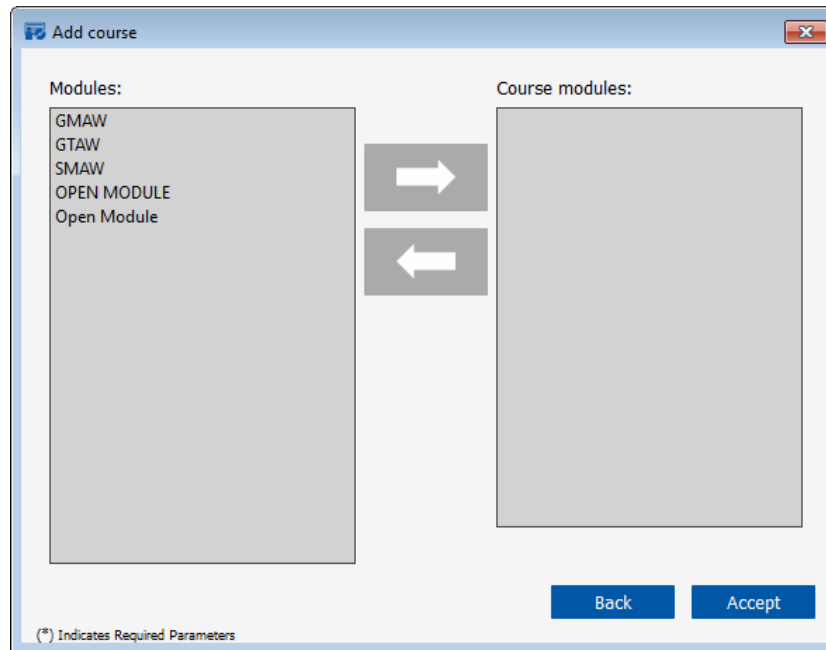


Figure 9-23. Adding Modules To A Course

B. Editing A Course

To edit a course, select the course in the left panel. In the right panel, choose the **Course data**, **Modules**, or **Students** tab and proceed with editing content as desired.

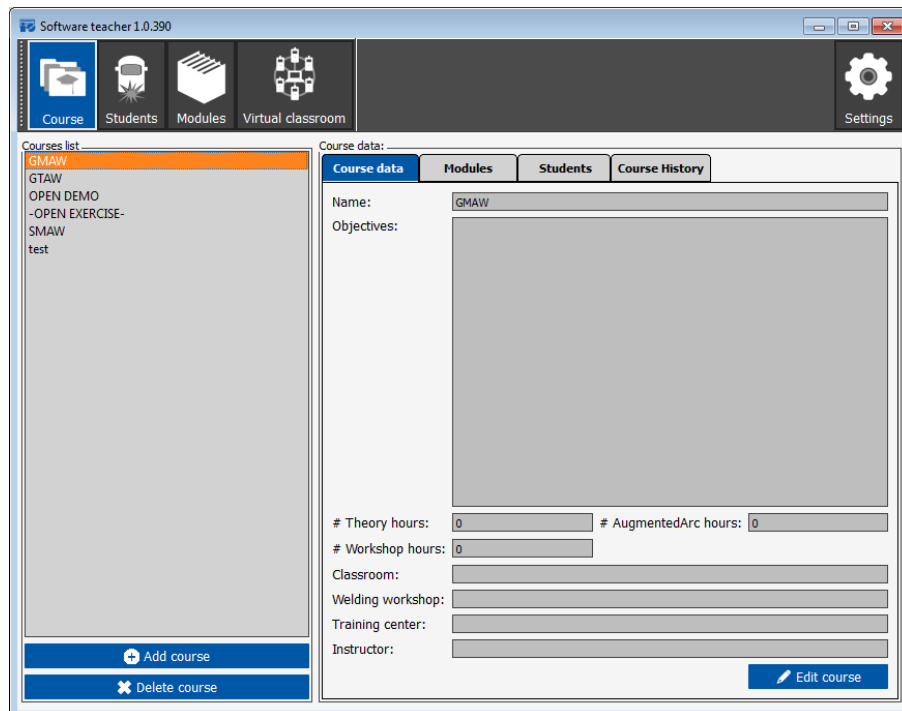


Figure 9-24. Editing A Course

C. Deleting A Course

Select the course to be deleted from a course list and click **Delete Course** (button in lower left portion of screen). Click **OK** in the Delete message box that appears. An error message is displayed if the course cannot be deleted. (Default courses cannot be deleted.)

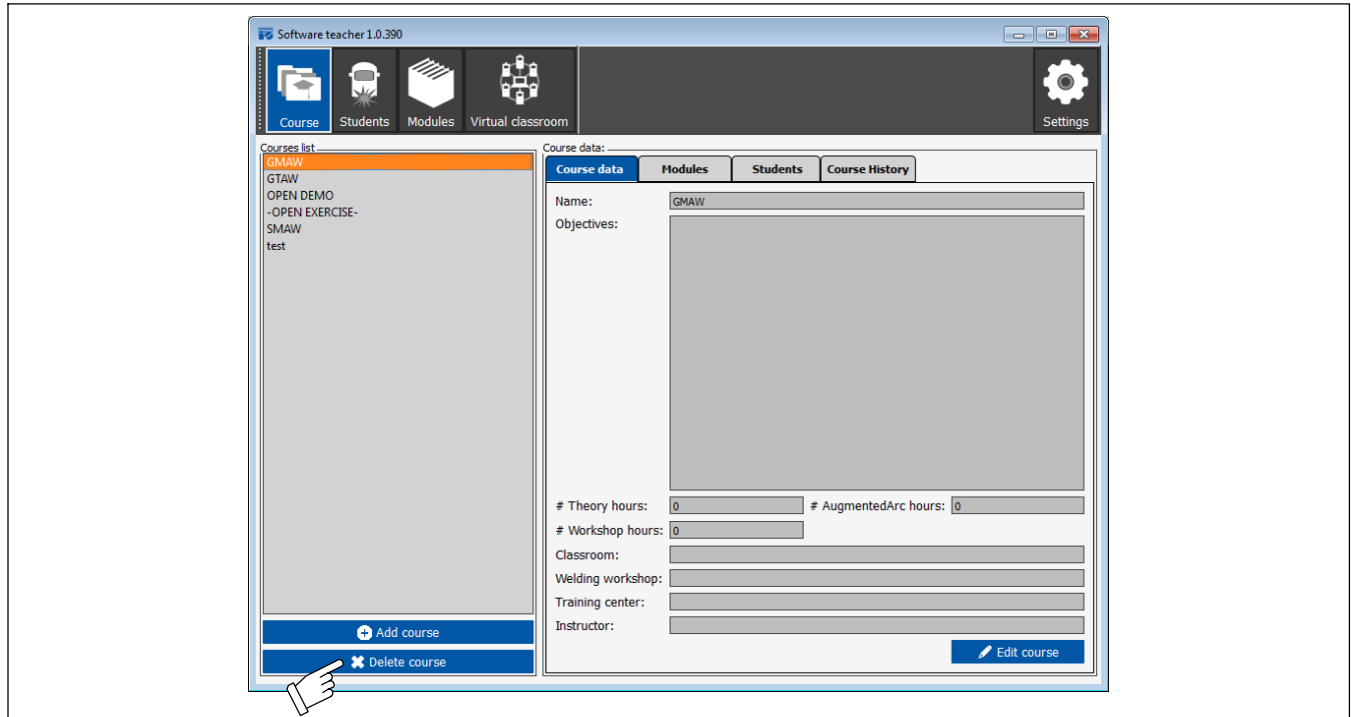


Figure 9-25. Deleting A Course Screen

D. Course History

The Course History screen shows the completion status (not started, in progress, or completed) for each student assigned to the course. It also shows the total simulated welding time (arc time) conducted by each student for welding exercises included within the course.

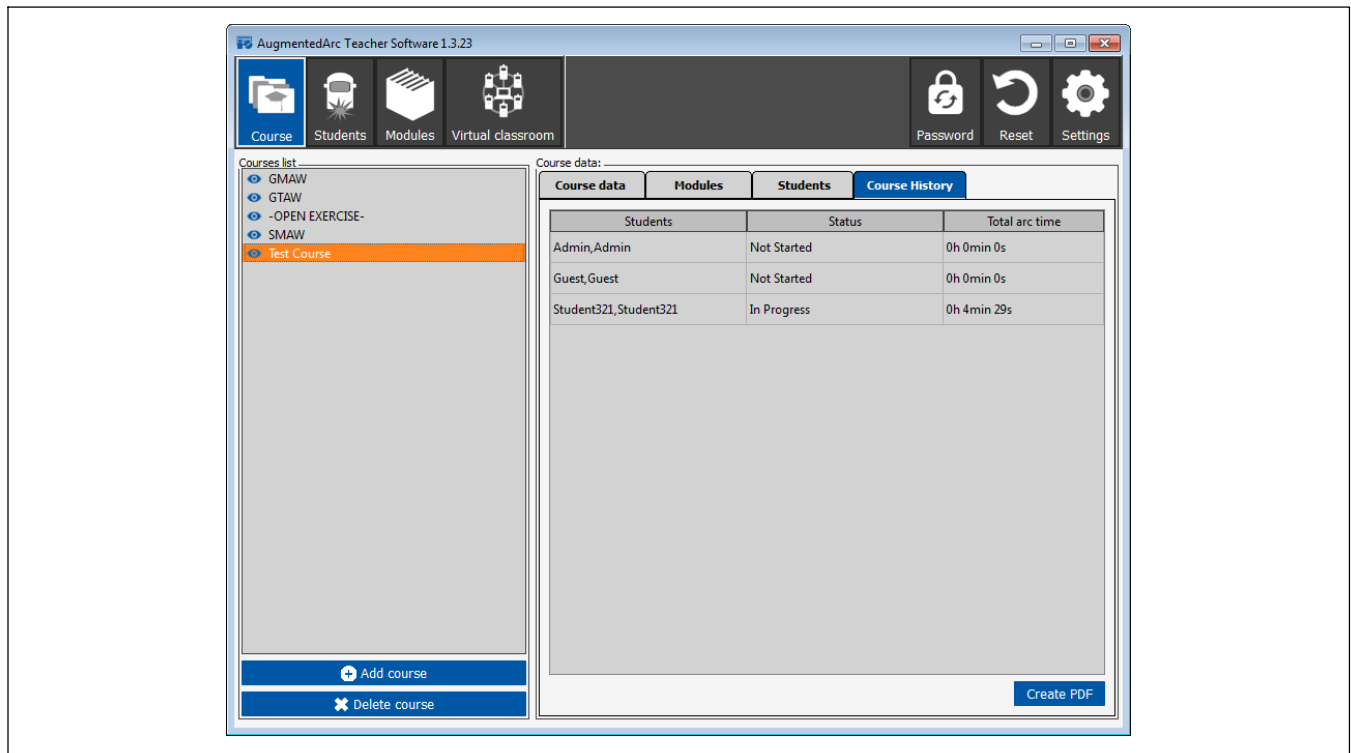


Figure 9-26. Course History Screen

9-5. Reviewing Student Activity And Results

A. Student Information (Figure 9-27)

Select a student to see their personal profile in the right side of the screen. Click **Course History** to display records of student progress. This screen provides information about the student's activities in a specific module. This screen also allows the teacher to determine which exercises a student has completed (and not completed), and how many activities remain for the student to complete the course. Expand a unit's contents to review the activities in that unit. The icons ✓ (pass) and ✗ (fail) indicate the status of completed activities.

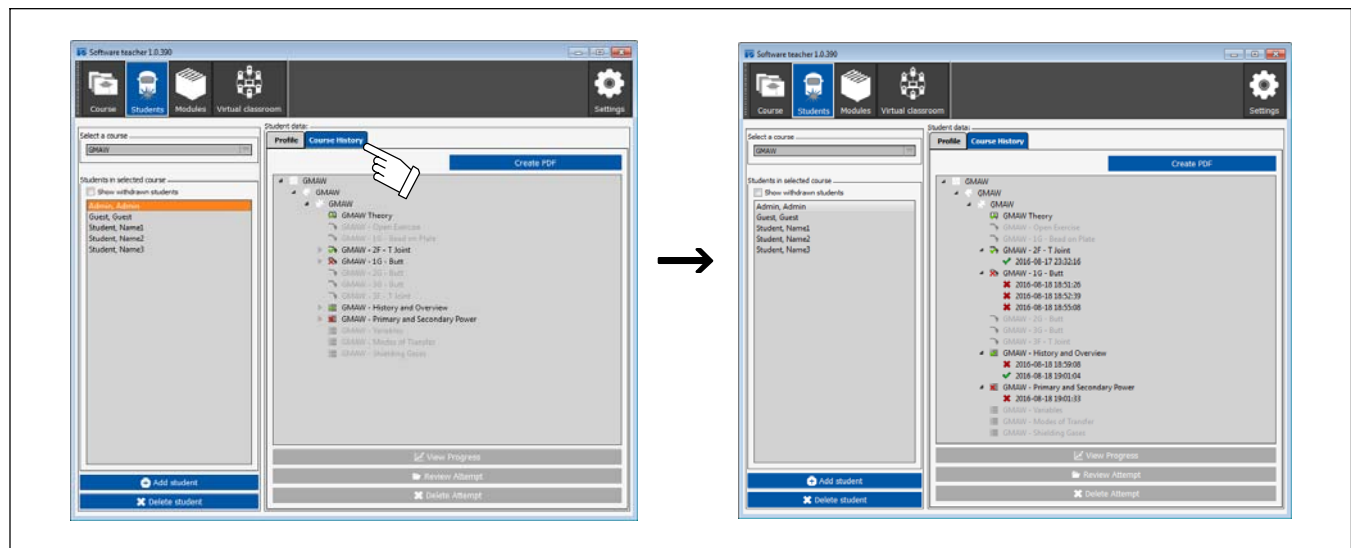


Figure 9-27. Student Course History Screen

Select **View Progress** to obtain a summary of the student's progress for a specific exercise. Double click a specific attempt to view detailed results (Figure 9-28). Options also exist to zoom (enlarge) or replay test results, or create a test report PDF.



Figure 9-28. Reviewing Recent Activity

B. Virtual Classroom

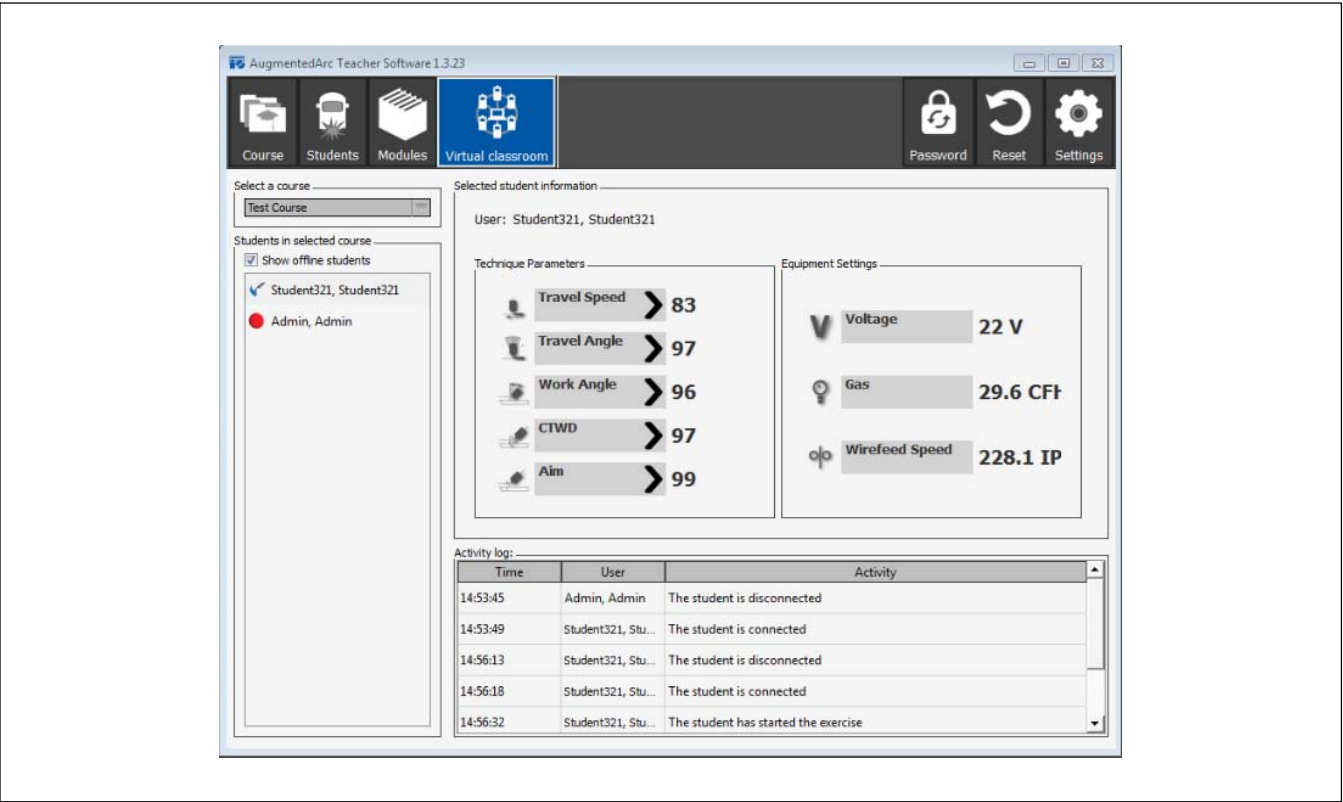








Figure 9-29. Virtual Classroom

This menu allows the teacher to monitor what is happening in the AugmentedArc classroom in real time. The virtual classroom shows a **Pass/Fail** score for each student.

First, select the course to be monitored. A list of the students in that course will be displayed on the left side of the screen. Choose whether to display all the students or only those connected. If the box is checked, both connected and disconnected students will be shown.

Students' names appear with an icon indicating their status:

	Connected.
	Disconnected.
	Connected and seeing theory.
	Connected and analyzing an exercise.
	Connected and doing a test.
	Connected and performing an exercise.

Students are listed in the following order: students with lower scores, students with higher scores, students that are doing a task (from the lowest to highest score), students analyzing an exercise, students doing a test, students viewing theory, connected students, and disconnected students.

The Activity Log displays each student's use of the simulator so the teacher can track their progress in real time.

Viewing Student Exercises In Real Time

The teacher can retrieve real time information for connected students doing an exercise. The student's name will be displayed with the simulation icon and their average score in real time. Click the student's name to view detailed information about their exercise on the right side of the screen, including work angle, travel angle, travel speed, contact tip to work distance (CTWD), aim, arc length, rod work angle, and rod filler angle. By default, all parameters are selected.

To focus on specific parameters (for example, areas in which the student needs improvement), deactivate the rest by clearing the check marks. Deactivated parameters are not scored. The real time average is calculated with only the selected parameters:

C. Creating Reports

The Teacher Software program can generate reports of all the information stored in it (student progress, student list, etc.). Almost all the Teacher Software screens include a **Generate Report** or **Create PDF** button. Click the button to generate a multi-page report.

9-6. Resetting AugmentedArc Content (Figure 9-30)

Click **Reset** to restore the system content to the original factory configuration. When confirmation messages appear (two times), select **Restore System Defaults** to proceed.

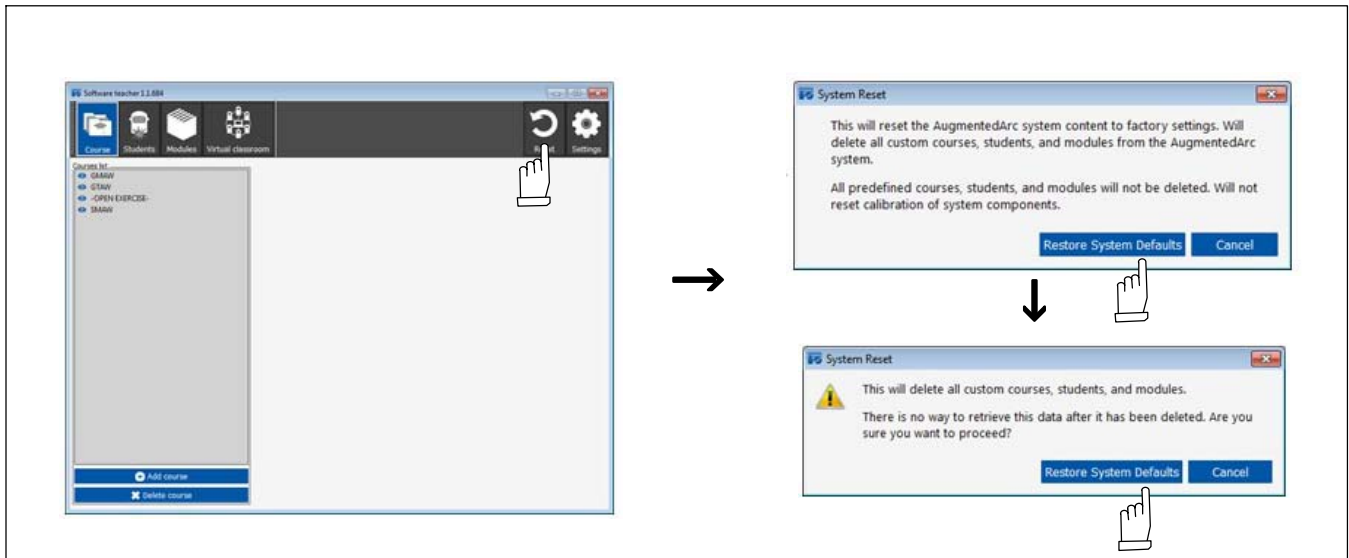


Figure 9-30. Resetting Content

9-7. Changing Teacher Software Password

Click **Password** to change the Teacher Software password. Enter the current password, the new password, and confirm the new password. Click **Accept**. A confirmation message is displayed if the password has been successfully changed.

Do not lose the password after it has been changed. If the password is lost, contact Miller technical support to recover it.

The user name will always be "teacher" and cannot be changed.

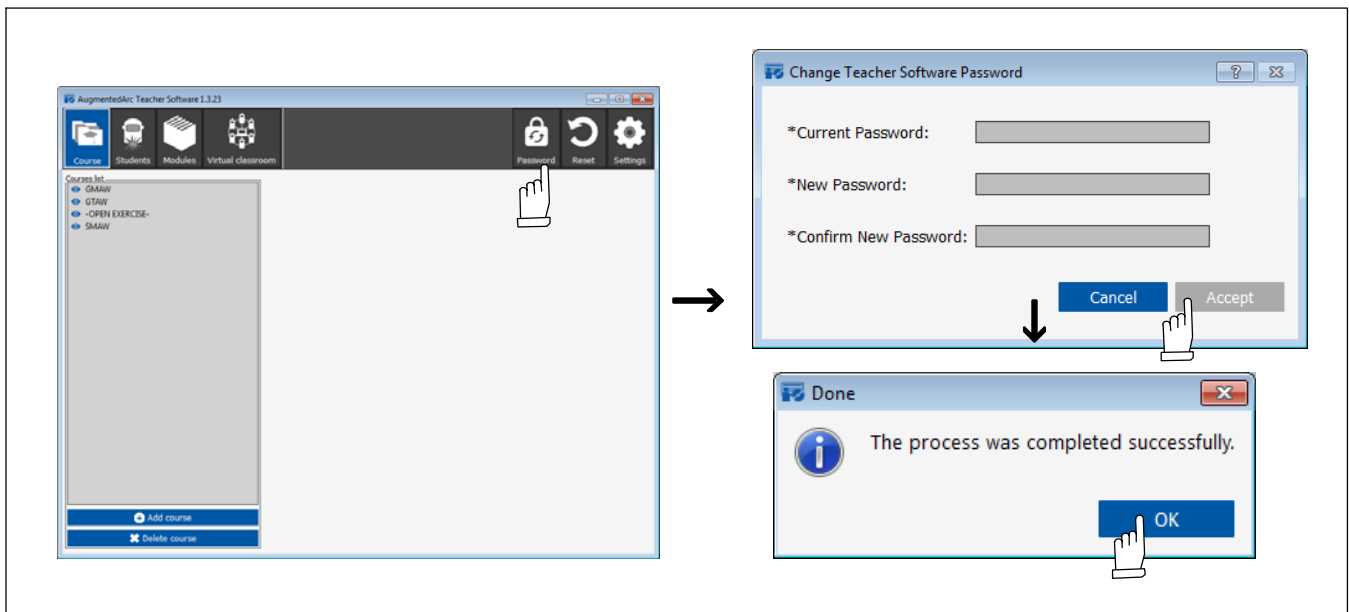


Figure 9-31. Changing Teacher Password

SECTION 10 – MAINTENANCE

10-1. Routine Maintenance

<div><div></div><div></div><div></div><div><div>Disconnect Power before maintaining.</div><div> <i>Service equipment more often if used in severe conditions.</i></div></div></div>					
<div></div>	<div>✓ = Check ◇ = Change ● = Clean ☆ = Replace</div> <div>* To be done by Factory Authorized Service Agent</div>				
Daily	<div></div> <div>● Simulator And Helmet Screens With Clean, Damp Cloth.</div> <div>NOTICE – Do not use chemicals, solvents, or abrasive cleaning solutions to clean touch-screen or lens covers.</div>	<div></div> <div>● Welding Gun, Torch, Electrode Holder, Filler Rod.</div> <div>NOTICE – Do not use chemicals, solvents, or abrasive cleaning solutions to clean touch-screen or lens covers.</div>			
Every 3 Months	<div></div> <div>☆ Damaged Or Unreadable Labels</div>	<div></div> <div>● Outer Surfaces</div>			

SECTION 11 – TROUBLESHOOTING

11-1. Troubleshooting Table

			<p> <i>Always be certain software is updated to the current version.</i></p> <p> <i>For Classroom mode systems, be sure both the simulator and controller are updated to the current version of software.</i></p>		
--	--	--	---	--	--

Trouble	Remedy
Simulator does not turn on.	Place simulator Input Power switch in On position. Place simulator Power On–Off switch in the On position (see Sections 5-3 and 6-1).
	Check input power connections at AC receptacle and simulator (see Section 5-1).
	Reset circuit breaker on power strip (if used). See Section 5-1.
	Have Factory Authorized Service Agent check simulator.
Augmented Reality system does not operate.	Remove dirt and debris from helmet screen.
	Adjust helmet lighting and check position of helmet and gun/electrode and workpiece.
	Have Factory Authorized Service Agent check simulator and gun/electrode.
System does not track gun/electrode.	Be sure hands, tools, or debris are not blocking markers on SmartGun.
	Adjust brightness of helmet/electrode LEDs.
	Clean camera lens cover.

SECTION 12 – RECONFIGURING STANDALONE ROUTER FOR CLASSROOM MODE

Reconfiguring the router is normally not required. Reconfigure the router only when instructed by Miller technical support.



Turn on the router.
No Ethernet connections are needed.

Be sure power is disconnected from all other AugmentedArc routers in the facility.

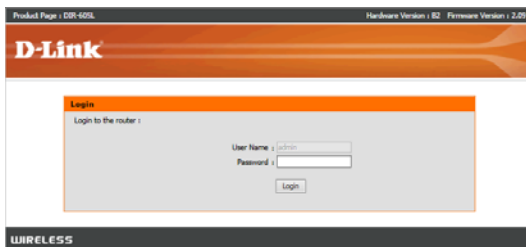


From a PC, connect to the AUGMENTED-ARC wireless network.

Network may not be available for several moments after turning on the router,



Open a web browser and enter `http://dlinkrouter.local/` as the IP address.



D-Link configuration page loads.
Log into the router.
User Name: admin
Password: AUGMENTEDARC (all caps)
Click **Login**.



Click **Advanced**.



Click **LAN Setup**.



Uncheck **Enable DHCP Server** Box.



Select **Save Settings**.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
-------------	---------------	-------------	-------------	----------

Figure 13-1. AugmentedArc Components (Continued)

... 8	...	301401	.. MIG Gun	1
... 9	...	277274	.. Butt Joint Coupon	1
... 10	...	277270	.. T-Joint Coupon	1
... 11	...	277275	.. Butt Pipe Coupon	1
... 12	...	277276	.. Pipe To Plate Coupon	1
... 13	...	277273	.. Lap Joint Coupon	1
... 14	...	276770	.. Label, Warning General Precautionary	1
... 15	...	265650	.. Handle Assembly, Center	1
... 16	...	277277	.. WiFi Antenna	1
... 17	...	277397	.. Router, Stand-Alone	1
... 17	...	278181	.. Router, Classroom	1
... 18	...	277266	.. Workpiece Stand	1
...	...	277269	.. MIG Gun AR Tip	1

* Recommended Spare Parts

♦ OPTIONAL

+ When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

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TRUE BLUE[®]

WARRANTY

Effective January 1, 2018

(Equipment with a serial number preface of MJ or newer)

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Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the delivery date of the equipment to the original end-user purchaser, and not to exceed twelve months after the equipment is shipped to a North American distributor or eighteen months after the equipment is shipped to an International distributor.

1. 5 Years Parts — 3 Years Labor
 - * Original Main Power Rectifiers Only to Include SCRs, Diodes, and Discrete Rectifier Modules
2. 3 Years — Parts and Labor
 - * Auto-Darkening Helmet Lenses (Except Classic Series) (No Labor)
 - * Engine Driven Welder/Generators
(NOTE: Engines are Warranted Separately by the Engine Manufacturer.)
 - * Inverter Power Sources
 - * Plasma Arc Cutting Power Sources
 - * Process Controllers
 - * Semi-Automatic and Automatic Wire Feeders
 - * Transformer/Rectifier Power Sources
3. 2 Years — Parts and Labor
 - * Auto-Darkening Helmet Lenses – Classic Series Only (No Labor)
 - * Auto-Darkening Weld Masks (No Labor)
 - * Fume Extractors – Capture 5, Filtair 400 and Industrial Collector Series
4. 1 Year — Parts and Labor Unless Specified
 - * AugmentedArc and LiveArc Welding Systems
 - * Automatic Motion Devices
 - * Bernard BTB Air-Cooled MIG Guns (No Labor)
 - * CoolBelt and CoolBand Blower Unit (No Labor)
 - * Desiccant Air Dryer System
 - * External Monitoring Equipment and Sensors
 - * Field Options
(NOTE: Field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
 - * RFCS Foot Controls (Except RFCS-RJ45)
 - * Fume Extractors – Filtair 130, MWX and SWX Series
 - * HF Units
 - * ICE/XT Plasma Cutting Torches (No Labor)
 - * Induction Heating Power Sources, Coolers
(NOTE: Digital Recorders are Warranted Separately by the Manufacturer.)
 - * Load Banks
 - * Motor-Driven Guns (except Spoolmate Spoolguns)
 - * PAPR Blower Unit (No Labor)
 - * Positioners and Controllers
 - * Racks
 - * Running Gear/Trailers
 - * Spot Welders
 - * Subarc Wire Drive Assemblies
 - * TIG Torches (No Labor)
 - * Tregaskiss Guns (No Labor)
 - * Water Cooling Systems
 - * Wireless Remote Foot/Hand Controls and Receivers
 - * Work Stations/Weld Tables (No Labor)

5. 6 Months — Parts
 - * Batteries
6. 90 Days — Parts
 - * Accessory (Kits)
 - * Canvas Covers
 - * Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
 - * M-Guns
 - * MIG Guns, Subarc (SAW) Torches, and External Cladding Heads
 - * Remote Controls and RFCS-RJ45
 - * Replacement Parts (No labor)
 - * Spoolmate Spoolguns

Miller's True Blue[®] Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, relays, work station table tops and welding curtains, or parts that fail due to normal wear. (Exception: brushes and relays are covered on all engine-driven products.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR COMMERCIAL AND INDUSTRIAL USERS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

The exclusive remedies for warranty claims are, at Miller's option, either: (1) repair; or (2) replacement; or, if approved in writing by Miller, (3) the pre-approved cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon use). Products may not be returned without Miller's written approval. Return shipment shall be at customer's risk and expense.

The above remedies are F.O.B. Appleton, WI, or Miller's authorized service facility. Transportation and freight are the customer's responsibility. TO THE EXTENT PERMITTED BY LAW, THE REMEDIES HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES REGARDLESS OF THE LEGAL THEORY. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT) REGARDLESS OF THE LEGAL THEORY. ANY WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY, OR REPRESENTATION, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, ARE EXCLUDED AND DISCLAIMED BY MILLER.

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Owner's Record

Please complete and retain with your personal records.

Model Name

Serial/Style Number

Purchase Date

(Date which equipment was delivered to original customer.)

Distributor

Address

City

State

Zip



For Service

Contact a *DISTRIBUTOR* or *SERVICE AGENCY* near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

Welding Supplies and Consumables

Options and Accessories

Personal Safety Equipment

Service and Repair

Replacement Parts

Training (Schools, Videos, Books)

Technical Manuals (Servicing Information and Parts)

Circuit Diagrams

Welding Process Handbooks

To locate a Distributor or Service Agency visit
www.millerwelds.com or call 1-800-4-A-Miller

Contact the Delivering Carrier to:

File a claim for loss or damage during shipment.

For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

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International Headquarters-USA

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